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Not entered at Stationers Hall

# THE
# GENESIS OF HARMONY

AN

## Inquiry into the Laws which govern Musical Composition.

'ΕΚ ΔΙΟΣ 'ΑΡΧΩΜΕΣΘΑ.

> "I must begin with rudiments of art,
> To teach you gamut in a briefer sort,
> More pleasant, pithy, and effectual
> Than hath been taught by any of my trade;
> And there it is in writing, fairly drawn."—
> *Taming of the Shrew.*—ACT III., SCENE I.

BY

HUGH CARLETON.

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FRANCIS DART FENTON,

CHIEF JUDGE OF THE NATIVE LANDS COURT IN NEW ZEALAND,

THIS TREATISE IS INSCRIBED,

WITH EVERY FEELING OF KINDLINESS AND ESTEEM,

*BY HIS OLD FRIEND AND MUSICAL ASSOCIATE,*

THE AUTHOR.

# PREFACE.

THE intended title for this work,—'Ευκλέιδης Κιθαρῶδος, has been discarded as too pretentious, promising more than can yet be performed. But the borrowing of certain terms, — such, for instance, as definitions, postulates, and problems, is convenient, and conducive to orderly procedure.

I must expect to be somewhat roughly handled from without: men do not readily abandon phraseology to which their ears have been used, or ideas which they have been long accustomed to hold as past dispute. But fault-finding will be received with deference; even with thanks, if it descend into particulars, thereby clearing the way towards amendment. Of course, if it be restricted to a mere "denial of my major," I acquire the right to ask for a better solution, so as to allow me to become the critic in turn. But if any one will point out an ἀνακόλουθον,—a weak link in the chain of argument, I shall gratefully confess, and endeavour to forge a better one.

A general objection might indeed be lodged, *ab initio*, to the system of Rameau, whose theory is here carried to more advanced conclusions. But even the high authority of Choron has failed to shake the conviction that Rameau's argument, up to a certain point, is sound. The failure in advance of that point would seem to arise from a hasty assumption that all the harmonic notes in use are obtainable from the divisions of one single string, called a monochord.

D'Alembert, in his admirable exposition of the system, thus found himself compelled to admit that in some particulars, it is disappointing.

" Nous n' avons pas dissimulé qu' il est certains points (quoiqu'en petit nombre) où le principe paraît laisser quelque chose à désirer. Telle est, par exemple, la marche diatonique de l'échelle du mode mineur en descendant; la formation de l'accord appellé communement *accord de sixte* *superflue*, et quelques autres faits moins importants, dont nous ne pouvons guère jusqu'ici alléguer de raison satisfaisante que l'expérience seule."

(*Discours Préliminaire.*)

Convinced that such exceptional cases admitted of solution, without departure from principle, I gave my mind, for some time without success, to searching out the cause of seeming anomalies; and in particular, to supplying a satisfactory analysis of the three chords, called abnormal,—the Great Sixth and Fifth, the Augmented Sixth, and the Neapolitan Sixth, without resorting to the desperate expedient of "Double roots," with their clashing overtones and tiersons. The result must be taken at its worth. It is at all events an independent endeavour to think out the system from the outset, in hope of surmounting acknowledged difficulties; an unpretentious effort to rescue thorough-bass from the confusion into which it has lapsed. At all events, no difficulty has been consciously evaded. I have nowhere cut the Gordian knot; having sought only to unloose it. Imperfections, such as they may be, instead of being glossed over, are studiously brought into relief, in the hope that some better man may be incited to surmount them.

The changes of nomenclature may be objected to, as going too far, or not far enough. The dilemma is acknowledged; but there is no escape, at least for the present. There is perhaps no science in which our ideas are so much swayed by words as the science of Music. With an imperfect knowledge of the phenomena, we frame inexact terms; and then, taking these shifty terms for standpoints, build up a rickety system. But, for obvious reasons, the endeavour has been to avoid change, except where the terms in common use are absolutely misleading. The nomenclature has been designedly left incomplete, and is therefore still open to objection.

Enquiry has been confined, as far as may be, to practical questions, directly affecting what is called "Thorough-bass;" avoiding digressions into the "Science of Sound" (though keeping it throughout in view), and into matters of mere antiquarian research. Æsthetic considerations have been reserved for separate treatment. All that is new resolves into a more searching analysis of accepted combinations than has been yet applied.

The main points of difference between this and other systems will be found to be—

i. The frank acceptance of the Sixth Overtone, bemol (Rameau's "son perdu"), as an independent note of the scale; being to Fa, with which it is usually confused, as 63 : 64. The arbitrary effacement of this sound from among its compeers,—of an early term, offered by nature in the spontaneous division of the monochord, ought to have excited suspicion from the first.

ii. The derivation of the notes in use from two monochords, cadentially related; and not from one, as heretofore: in Pythagorean phraseology, the substitution of the fertile "duad," for the ungenerative "monad." This is the essential deviation from earlier systems; in nautical parlance, a fresh departure.

iii. The use of a notation by which the contrast between the two sets of notes, thus obtained, is presented to the eye.

iv. The generic distinction of monochordal, or half cadences, from bichordal, or full cadences.

v. The carrying out of what shall be called "The Cadential System" to its ultimate conclusions.

vi. The distinction, which is essential, of dissonances from discords.

vii. The substitution of the Pentechord for the Tetrachord.

viii. The more accurate distinction of what can be demonstrated, from what must be assumed by postulate.

ix. The clearance of not a little rubbish out of the road.

Occasional repetition, impairing perfect neatness of demonstration, will be found. Superfluous words were easy to excise, but have been designedly left standing, in order to clear the page of difficulty without continual backward reference. Cursory readers cannot be expected to recollect each several step in the main argument, like undergraduates taking up their Euclid for a poll degree.

The variation of type is for the purpose of saving labour in perusal. The Pica may be read alone, as complete in itself. The Long Primer is explanatory; and the notes, in Bourgeois, are discursive.

I take occasion to state that what follows was undertaken with familiar knowledge of standard English and Italian teaching, as it used to be; but without access, sixteen thousand miles away, at the Antipodes, to works of the latest date. This is mentioned, not by way of excuse for shortcomings, but to forestall the charge of plagiarism, should I have been anticipated in anything put forward as original. In point of fact, nothing has been borrowed. All has been deduced, progressively, from the source already indicated. Wherever others shall have deduced the same, it is so much in favour of the deductions. Where they have not, I must be held responsible for innovation.

It is possible, perhaps likely, that occasional errors may be detected in this Essay. But if, taken as a whole, it should prove suggestive to after-comers, the labour will not have been altogether without result.

*Royal Colonial Institute,*
15, Strand, London.

# TABLE OF CONTENTS.

## CHAPTER I.

### PRELIMINARY.

1. The Science of Music less perfect than the Art. 2. The various causes which have led to confusion of ideas.

## CHAPTER II.

### NOMENCLATURE.

1 Extract from the Kosmos, concerning the employment of scientific terms. 2. Complete reform in the Terminology of Music not possible as yet. 3. Certain anomalies and loose usages of words pointed out.

## CHAPTER III.

### RECTIFICATION OF TERMS.

1. Endeavour to disentangle the Science of Music from its Vocabulary. 2. Partial reform of Vocabulary: necessary amendments only suggested.

## CHAPTER IV.

### NOTATION.

1. The system of Notation now in use well devised and almost complete. 2. Some not very material improvements suggested. 3. Further amendment of terms. 4. Specialities of Notation in this treatise explained.

## CHAPTER V.

### THE MONOCHORD.

1. Acquaintance with the Phenomena of the Multiple Resonance presumed. 2. Mention of objections taken, *ab initio*, to Rameau's Theory of Harmony. 3. Objections shewn to be of little worth. 4. Rameau's system unimpeachable, up to a certain point, but not fully developed. 5. The system taken up, in this Treatise, at the point where Rameau left off. 6. The main points of Rameau's Theory set out. 7. Diagram shewing the aliquot parts of the String: the Sounds corresponding to those parts. 8. The Series of Overtones theoretically infinite: only the twelve first in use, forming the Great Chord. 9. The true nature of Bemol, Flat Seventh on the Dominant. 10. Overtones upon the Monochord presented in another form. 11. Arbitrary classification of Overtones as Consonances and Dissonances. 12. The Flat Seventh should be termed the Appellative Concord. 13. Questions of Degree, pursuing us throughout the enquiry. 14. Continuous change of character in the ascending Overtones. 15. ♮b, the fourteenth overtone on prime C, ousted from use by another ♮b, fourth overtone on prime G. 16. Adoption of the ♮b derived from G, shewn to be the cause for arresting the upward succession of overtones after the Twelfth. 17. "A fresh departure"; two Primes used instead of one, as heretofore; consequently two Monochords, tuned respectively as Tonic and Dominant. 18. The Cadential System of Harmony.

## CHAPTER VI.

### THE CHORD.

1. The Chord takes precedence of the Scale. 2. The Great Chord, parent of all other chords, formed by all the overtones in use, excluding replicates. 3. The Tetrad, formed by subtraction, not by addition: by omission of the three highest notes of the Great Chord. 4. The Triad, by omission of four. 5. The Tetrad, a dominant chord; the Triad, a tonic chord. 6. The chord of § on the Dominant transitive,—an imperfect Tetrad; The Triad intransitive.

## CHAPTER VII.

### THE CADENCE.

1. Connects the Tetrad with the Triad; thus forming the Double Chord. 2. Manner of arriving at a Cadence. 3. The Monochordal Cadence. 4. The Bichordal Cadence, derived from two monochords, cadentially connected. 5. Primes may be represented by their overtones; consequently, the prime cadence may be so represented. 6. The Monochordal Cadence stationary; The Bichordal Cadence progressive.

## CHAPTER VIII.

### THE SCALE.

1. Formed from a succession of Bichordal Cadences. 2. Diagram, indicating nodes upon two monochords, and giving angular measurement of intervals. 3. The old Tetrachordal Scale. 4. Ascending Tetrachord, bequarre, fa, sol, la. 5. Descending, bemol, la, sol, fa. 6. The two combined form the Pentechord. 7. The extreme notes of the Pentechord, bequarre and bemol, commonly called mi and fa, the characteristic notes of the Scale. 8. The Pentechord the master key.

## CHAPTER IX.

### The Transposed Pentechord.

1. Substitution of the G—C cadence for the C—F cadence. 2. Diagram altered accordingly; from the key of F to the key of C. 3. The Tonic called Ut; the Dominant called Do-sol, or Do for shortness. 4. The seventh of the ascending scale called bequarre, or, for solmisation, be: of the descending scale, si. 5. The fourth of the ascending scale called Fa; of the descending scale, bemol; for solmisation, mol. 6. Notation of the Pentechord adapted to the altered Diagram. 7. A cadence from re to Ut; but not from Ut to re. 8. Maintenance of the fixed cadences of the Pentechord throughout all ensuing complications.

## CHAPTER X.

### The Heptachord and Octochord.

1. The Heptachord presented in two forms; as the Normal Heptachord and as the Standard Heptachord. 2. Problem i: to construct the Normal Heptachord. 3. Two cadences, *i.e.*, the one prime cadence repeated, make a Tetrachord. 4. New Cadence, called "the Upper Cadence," adopted. 5. The Upper Cadence repeated, gives a new Tetrachord. 6. Two Tetrachords make a Heptachord. 7. Problem ii.: By transposition of the Tetrachords the Normal Octochord obtained. 8. The Break, caused by interruption of the series of fifths. 9. The Break the weak link in the Scale. 10. Problem iii.: To construct the Standard Octochord. 11. Two modes of construction, by means of either two Prime Cadences, or of three, equivalent to as many Tetrachords. 12. Construction by two Tetrachords. 13. Crasis of the two *e*'s,—mi and bequarre. 14. The anomaly of two primes in diatonic succession, involving a modulation. 15. Problem iv.: To construct the Standard Heptachord. 16. Three prime cadences required:—the Lower Cadence (D, G), the Mean Cadence (G, C), and the Upper Cadence (C, F). 17. The Three Tetrachord Scale,—the Decachord. 18. Contains ♯f and ♮F, shewing the equivocal nature of the fourth of the Scale. 19. Problem v.: To construct the Standard Octochord; second form. 20. The true cadential accentuation of the Scale. 21. The essential differences of the two forms of the Standard Octochord. 22. Problem vi.: To construct the Scale, Normal or Standard, descending. 23. The descending cadences of the Pentechord. 24. Exposition of the so-called Hexachord. 25. Essential difference between the Heptachordal and the Octochordal Scales. 26. Both in actual use. 26. Octochord blemished by a glaring *mi contra fa*. 27. Exemplified in melody.

## CHAPTER XI.

### The Minor Mode.

1. The Minor Mode unreal. D'Alembert's admission of difficulty. 2. The Minor Scale not derived, as is the Major, from a Prime Bass. 3. The Scale assumed; and then, a contrapuntal bass applied to it. 4. Minorized notes granted by Postulate. 5. Canon of Minor Scale, with usual Bass. 6. True Bass to Minor Scale unworkable.

## CHAPTER XII.

### Analysis of the Minor Scale.

1. Operation conducted on the "Tonic Minor," C, and not upon the "Relative Minor," A. 2. Problem vii.: To construct the Minor Scale. 3. Formed conventionally, by substitution of a Minor Third for a Major, on each Tonic bass note of the Scale. 4. This formula fulfils every condition. 5. Question: Is the ratio of the Minor Third (Ut, ♭mi) the same as that of the Little Third (mi, sol)? 6. Thirds on Tonic Primes called Mutable Notes. 7. The Sharp Third on the Dominant immutable,—incapable of minorization. 8. Tonic Primes are the first and fourth ascending; the fifth and first descending. 9. First manner of construction, ascending;—A, the sixth of the Scale, being a third upon F, a Tonic Prime, is minorized. 10. Second manner: A remains Major, being a fifth on Prime D. 11. Problem viii.: The Minor Scale, descending. Formed from the descending cadences of the Pentechord, minorizing Tonic Thirds. 12. The Minor Sixth of the descending Scale a *crux*; for ♭b and ♭a cannot both be Minor Thirds on Tonic Primes. 13. Treatment of ♭b as a Flat Seventh; ♭a as a Minor Third. 14. Formation of Scales, Major and Minor, concluded. 15. Names of the Degrees. 16. Old names retained, with three exceptions; Sol being termed Do-sol, or Do; si, of the ascending scale, being termed bequarre, or be; and fa of the descending scale, bemol, or mol. 17. Explanation of the terms, Scale Notes, and Stave Notes; Scale Notes, indicated by names, Ut, re, &c., movable; Stave Notes, by letters of the alphabet C, d, &c., of invariable, commonly called absolute, pitch.

## CHAPTER XIII.

### The Dissonant Overtones.

1. The Ninth, Eleventh, and Thirteenth on the Dominant, do-la, do-ut, and do-mi; termed Chord Notes, as belonging to the Chord, but not to the Scale. 2. do-ut and do-mi monochordally cadential; do-la of mezzo-carattere,—bichordally as well as monochordally cadential. 3. do-la and do-mi mutable; do-ut fixed. 4. Diagram, including Chord Notes.

## CHAPTER XIV.

### Derivative Cadences.

1. Subordinate forms arising from the Monochordal, or Half Cadence; and from the Bichordal, or Full Cadence. 2. The Monochordal has but one Prime; the Bichordal passes from one Prime to another Prime. 3. The Full Cadence, with its several representatives, passes from Dominant to Tonic. 4. The Counter-cadence, from Tonic to Dominant. 5. The Continuous, or Chain Cadence, from Dominant to Dominant. 6. The Broken, or Abrupt Cadence, abnormal; being by gradual ascent of one Prime to another Prime. 7. Proceeds either by a tone, or by a little tone. 8. Takes place on the Fifth and Sixth of the Scale. 8. Involves Modulation. 9. The rule of "Bass Terminations." 10. The Plagal Cadence; from Fa, Upper Tonic, to the corresponding Dominant. 11. Not a separate form of Cadence, being merely an Upper Counter-cadence. 12. First root-note of Plagal Cadence bears Major or Minor Third; the second note bears the Sharp Third only. 15. Origin of the practice of ending a Minor Strain with a Major Chord.

## CHAPTER XV.

### Derivative Chords.

1. All the Chords in use, granting their minor varieties, derived from the Great Chord, on a Dominant, and from the Triad, on a Tonic. 2. One exception,—a Compound Chord. 3. The Common Chord, $\substack{5\\3}$, an inverted form of the Triad. 4. Sections of the Great Chord may be taken as Chords. 5. Distinctive figuring of Chords. 6. The Ninth and the Thirteenth on the Dominant mutable notes; the Eleventh immutable.

## CHAPTER XVI.

### Monochordal and Bichordal Intervals.

1. Treated together, for the sake of contrast. 2. Monochordal Intervals played harmonially; Bichordal Intervals, melodially. The latter in the nature of discords; the former, never more than dissonant. 3. Monochordal Intervals distinguished as Normal, and Sectional: Normal, when based on a Prime note; Sectional, on an Overtone. 4. Examples of Monochordal Intervals. 5. Ordinary classification of Intervals, according to width, repudiated. 6. Classification according to quality and appropriate place in the Scale. 7. Examples of Bichordal Intervals. 8. Specific distinctions of Intervals needed, as well as Generic. 9. Monochordal Intervals distinctively named. 10. Essential difference between the Monochordal Second, or Tone, and the Bichordal Second. 11. There is no Diminished Fifth. 12. Bichordal Intervals distinctively named. The Bichordal Second, discordant; the Monochordal Second only dissonant. 13. The several Fourths:—the Consonant Fourth; the Dissonant Fourth; the Discordant Fourth,—real Fourths; to which are to be added the Sharp and the Diminished Fourths. 14. Example from Bach of the Diminished Fourth, exhibited melodially. 15. Systematic construction of Monochordal Intervals summarized.

## CHAPTER XVII.

### The Fifth and the Fourth of the Scale.

1. The Fifth of the Scale assumes a three-fold character: Tonic, Dominant, and Overtone on Ut. 2. Sometimes comes in as Tonic, going out as Dominant. 3. The Fourth of the Scale, either Upper Tonic, Bemol, or Bequarre. 4. Corresponding to the changes in aspect of the Fifth, are those of the Fourth. 5. When the Fifth comes in as a Tonic, the Fourth of the Scale is sharp, being a leading note. 6. Therefore ♯f, as well as ♮f, may find a place in the Scale of C. 7. Shall be termed the "Equivocal Note." 8. Diminished Third obtained by means of the Equivocal Note. 9. The Equivocal Note enables us to treat the Minor Third as a Little Third. 10. Also legalises certain cases of so-called faulty cross-relation.

## CHAPTER XVIII.

### The Chromatic Scale.

1. Not in reality a Scale; but the name may be conveniently retained. 2. Obtained from a series of modulations, governed by the Chain Cadence. 3. The notes mere gatherings from various keys. 4. There are practical means, nevertheless, of accounting for all the Half-tones of the Scale, excepting ♭re. 5. Other Half-tones obtained by transposition.

## CHAPTER XIX.

### THE DISSONANT CHORDS.

1. Compounded with, or wholly composed of Dissonant Overtones. 2. The most remarkable are those called the Great Sixth, the Augmented Sixth, and the Neapolitan Sixth. 3. Chord of $^{6}_{5}$, the first inversion of the Chord of the Seventh on the Second, which is a section of the Chord of the Eleventh. 4. The Dissonant Note is 5; not 6. 5. The gap left by the "Break" bridged across by means of this Chord. 7. The rising flat, from ♮f to G, legitimate, the Cadence being Monochordal. 8. The Augmented Sixth ungrammatical. 9. Not a Monochordal, but a Bichordal Interval. 10. Cannot legitimately be played harmonially; for if it were, one chord would have two roots, contradicting each other. 10. To obtain a Monochordal Interval, substitute la, the fifth on Re, for la, the third, Major or Minor, on Fa. 11. The lower note of the Augmented Sixth a passing note, treated as a substantial note. 12. In reality a Discord. 13. Another solution offered, treating ♭la as a Minor Ninth on a Dominant. 14. The ♯fa, which was Consonant, is now Discordant, a passing note. 15. The full chord of the Augmented Sixth comprises three varieties. 16. The Italian Sixth, analysed. 17. The French Sixth. 17. The German Sixth. 18. Analysis of the Neapolitan Sixth. 19. Compared with analysis by Sir John Goss. 20. Compared with analysis by Sir Frederick Ouseley. 21. The doctrine of two roots untenable. 22. Chord of the Great Seventh, based on bemol.

## CHAPTER XX.

### POSTULATES.

1. Postulates already assumed, as occasion required; now gathered together. 2. Their object; to legalize certain compromises with the ear.

## CHAPTER XXI.

### FIFTHS, EIGHTHS, AND MI CONTRA FA.

1. All tainted by the same fault,—an irregular succession of Greater Thirds. 2. Not the cause, but the result of bad harmony. 3. Faulty, because they depart from the Canon of the Cadence. 4. All not equally objectionable; the rule too much generalized; lawful Fifths. 5. Fifths arising from resolution of the German Sixth. 6. Differences of opinion: Albrechtsberger forbids; Choron tolerates. 7. Solution of the question. 8. The saving of Fifths; the imperfection still latent, however disguised. 9. Modern practice governed by the Spartan rule; the eleventh commandment—"thou shalt not be found out."

## CHAPTER XXII.

### THE FIGURED BASS.

1. Two possible systems, differing essentially, as pointed out by Choron. 2. System in common use a jumble of the two. 3. Choron's own system retains the fault he complains of. 4. Figuring ought to be made symbolical, by always marking the two characteristic notes,—bemol and bequarre; also Major and Minor notes. 5. Misuse of terms: *ex. gr.*, Major and Minor. 6. Symbolical figuring systematically combined with numerical figuring. 7. Symbolical figuring indicates the Chord-roots, and the basing place of each chord in the Scale.

## CHAPTER XXIII.

### NUMERICAL VALUATION OF INTERVALS.

1. "Selection" of Intervals unsystematic; Intervals must be taken as they come, in natural procession, and accounted for. 2. The Flat Seventh has to be accepted, as a real note. 3. Rameau's manner of calculation. 4. His divergence from an Arithmetical, to a Geometrical progression, seemingly unnoticed, though entailing that grave defect which culminates in the Pythagorean Komma. 5. The Fourth of the Scale, treated by some as an intruder, systematically accounted for. 6. Re-arrangement of the numerical series, indicating the "Unacknowledged Notes." 7. Imperfect intercorrespondence of any two Tetrachords. 8. The Twelfth, Seventeenth, and Twenty-first above "mirrored" by the same distances below. 9. A Minor Ninth supplied by the Seventeenth below. 10. Sir Frederick Gore Ouseley's manner of arriving at the "Minor Third of Nature." 11. It does violence to systematic exegesis, by arbitrary "selection" of overtones. 12. The question, which is highest, ♯a, or ♭b, involves a confusion of words. 13. The "Komma of Pythagoras," compelling temperament of the Cycle of Fifths. 14. The numerical value of such temperament to be taken into account, in calculating the relative value of notes.

## VOCABULARY.

A summary of the changes of diction adopted in this Essay.

## APPENDIX.

Calling to notice the unsuspected use of musical terms, now obsolete, by Shakspeare.

# CHAPTER I.

## PRELIMINARY.

> Il ne faut pas chercher ici cette évidence frappante, qui est le propre des seuls ouvrages de la géométrie, et qui se rencontre si rarement dans ceux où la physique se mêle........On ne doit pas attendre en cette matière à ce qu'on appelle démonstration; c'est beaucoup que d'avoir réduit les principaux faits en un système bien lié et bien suivi; de les avoir déduit d'une seule expérience, et d'avoir établi sur ce fondement si simple les règles les plus connues de l'Art musical.
>
> (*Elèments de Musique.*)
>
> D'ALEMBERT.

The Art of Music has been already carried by the great masters to a degree of refinement which cannot be far removed from perfection; but the Science of Music[*] is still beset with not a little confusion. As usual, practice has preceded theory.

This confusion seems to have arisen from various causes.

i. From imperception of the Canon of the Cadence.[†]

ii. From disuse of the tetrachordal rule of solmisation, and the substitution of an octochordal rule.[‡]

iii. From the effacement of the flat seventh on the dominant, and the substitution of another note, (sharper by a komma) which goes by the name of sub-dominant.

---

**SCHOLIA.**

[*] By science I mean the scientific analysis of results, long since empirically obtained; confining the treatment, in this Essay, mainly to the resolution of a mass of harmony into its component parts.

[†] Caused by an indefinite use of the phrase "Scale of Nature;" and by the endeavour to derive the octochordal scale from the overtones of one string only.

[‡] That is to say, from the substitution of ut, re, mi, fa, sol, la, si, ut, for the old-fashioned "tuning of degrees,"—mi, fa, sol, la, fa, sol, la.

iv. From the consequent mutilation of the Tetrad,* and the destruction of its complete resolution,—namely, on the Triad.†

v. From the assumption that the ascending and descending tetrachords are one, taken *de recté et retro.*‡

vi. From neglect of the lesser Diapente, hereinafter termed "Pentechord."‖

vii. From faith in the Hexachord of Guido.

viii. From an unduly limited use of the word "modulation," which is from tetrachord to tetrachord. The use of the word is now confined to the passage from one octochord to another.§

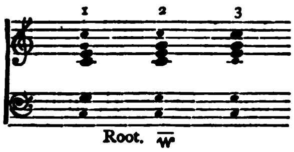
ix. From neglect of the fact that each tetrachord is true to itself; but that no one tetrachord is true throughout to any other tetrachord."¶

---

* In other words, from treating the Dominant Seventh as a *note of addition*, and not as an essential note of its chord. The error seems to have arisen from the theoretical exclusion of the harmonic seventh, an "unselected" note, supposed to be out of tune. But it is not out of tune, if treated with its proper *entourage;* and is moreover in practical use. f, the flat seventh on the dominant,—that is to say, bemol, is in tune as a note of the descending scale, though too flat to take the place of Fa, subdominant, in the ascending scale.

† That is to say, on the chord of $\genfrac{}{}{0pt}{}{6}{4}$,—the *first* form of Triad obtainable from the natural procession of overtones; $\genfrac{}{}{0pt}{}{6}{3}$ being the second form (or first inversion of the common chord, if that expression be preferred), and $\genfrac{}{}{0pt}{}{5}{3}$ the third form.

This becomes evident when the three forms of Triad are placed successively on the stave.



It thus appears that $\genfrac{}{}{0pt}{}{5}{3}$, though by common repute the normal form, is not entitled to the primacy that has hitherto been claimed for it.

‡ The ascending tetrachord is, si, ut, re, mi. The descending tetrachord is not, mi, re, ut, si; but fa, mi, re, ut.

A more proper naming would be,—bequarre, ut, re, mi; and bemol, mi, re, ut. This will be established in due course.

‖ The Pentechord is formed by an ascending and a descending tetrachord conjoined,—si, ut, re, mi · fa, mi, re, ut; bequarre and bemol being its two extremes.

§ Modulation into sharps implies "mi contra fa;" and deforms (notwithstanding disguise by means of accompaniment) the standard octochord scale.

¶ That is to say, according to the received notions of what is "in tune." If re, of the first tetrachord, be rightly expressed by $^9/_8$, la, of the second tetrachord, cannot be at once a perfect fifth to re, and a perfect third to fa. Again, fa upon re is less than what is commonly called a minor third. For $^9/_8 \times {}^6/_5 = {}^{27}/_{20}$. But $^{27}/_{20}$ is to $^4/_3$, the numerical value of fa, as 80 to 81.

It might indeed be argued that re is not $^9/_8$,—that from the value of re has to be subtracted re's own share in the Komma of Pythagoras. This, by way of anticipation.

x. From the substitution of an incomplete Henneachord, for the true Octochordal scale.*

xi. From the treatment of the Little tone, or tonule, as a fractional, and not as an integral quantity;—*i.e.*, as a part of what is commonly called a whole tone.

xii. From neglecting to distinguish the little tone, mi—fa, from the half-tone, ♭mi—mi; which last will mean, in this Treatise, the difference between the major and the minor thirds.†

xiii. From the assumption that the scale of the minor mode is real; that is to say, deducible, like that of the major mode, from a ground bass.

xiv. From the assumption that chord-intervals are "built up," as it were, by layers of tones and half-tones:—*ex. gr.*, a perfect fifth, of three whole tones and a half-tone. ‡

xv. From the naming of intervals by quantity rather than by quality; *i.e.*, by extent, or span, rather than by character. ||

xvi. From the neglect to distinguish chord-notes from scale notes. §

xvii. From the confusion of ideas, concerning flats and sharps, induced by the party-coloured keys of the clavier; with the consequent introduction of the word "natural,"—meaning, a white key.

xviii. From the use of the term "relative minor."¶

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* The Henneachord contains ♭ b, as well as ♮ b;—that is to say, bemol as well as bequarre. It is identical with the fourth octave of overtones on the monochord. The Germans, virtually adopting the Henneachord, distinguish ♮ b as "h;" seemingly unaware that the ♮ b, *so derived*, is not in use at all. Three hundred years ago, every musician knew that ♮ b was mi.

The error, already mentioned, arises from the attempt to derive all the notes of the scale from the overtones of the monochord, and not from the procession of cadences afforded by the overtones of the double chord.

† The term "half-tone" should be altogether abolished, as worse than unmeaning. It is mischievous, leading to the false impression that a tone is divisible into equal parts. *Vide* Euclid, Theorem xvi. Ὁ τόνος ὀυ διαιρεθήσεται ἐις δύο ἴσους, ὀυτε ἐις πλέιους.

‡ Or, by a still greater error, of half-tones, so-called:—*ex. gr.*, that the fifth consists of eight half-tones, and the octave of thirteen. The interval springs directly from its prime, or generator, and is homogeneous, if such a term can be allowed. It is, however, none the less true that each chord-interval is capable of being divided into sections, corresponding to the tones and tonules in question,—that it may be measured by them, as a mile by a yard-stick.

|| For instance, calling ♭mi—ut a major sixth because it is wider than ♮mi—ut.

§ With this may be coupled the invention of the term "notes of addition."

The meaning of the terms, chord-notes and scale-notes, will be presently explained. Scale-notes are (in addition to primes), the third and fifth upon the tonic; the third, fifth, and seventh upon the dominant; and the third upon the fourth of the scale.

Chord-notes are, the ninth (major or minor), the eleventh, and the thirteenth (major or minor), all upon the dominant. By this distinction are we enabled to characterize the two la's, related to each other as $^{27}/_{16}$ to $^{5}/_{3}$; *i.e.*, as 81 to 80.

¶ The term appears to be associated with the black and white keys of the clavier, and with the armature of the stave. C major has to be compared with C minor, not with A minor. The fact that the descending scales of A minor and of C major are alike played on white keys is accidental.

xix. From imperception of the fact that all music, of any higher character than such as is afforded by the Æolian harp, is based upon a series of compromises with the ear; that the very toleration of it is due to the imperfection of the ear; *i.e.*, to the irrecognition by the ear of "double treatment" in any but those extreme cases which are termed "enharmonical changes."[*]

xx. From irrecognition of the cardinal doctrine that the tonic is flanked by its two fifths; the one supplying the fourth of the scale, and, indirectly, the sixth; the other supplying the fifth of the scale, and the sharp seventh.[†]

xxi. The displacement of *μέση*, from the middle to the extremes.[‡]

xxii. The superstitious veneration paid to the octochordal scale, as if it reigned by right divine.

xxiii. The treatment of the so-called Chromatic Scale as a reality,—as something more than a conventional sequence of notes.

xxiv. The confusion of flat notes and of minor notes; the difference being essential.[||]

xxv. From drawing an arbitrary distinction between consonance and dissonance, while confusing dissonance with discord.

xxvi. From the introduction of the name "si," as distinguished from "mi."

Lastly, and mainly, from the use of an imperfect and corrupt nomenclature.[§]

Some of these dicta, thus broadly enunciated, risk being treated as "stuff to make paradoxes." But their seeming strangeness will disappear as we proceed.

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[*] Double treatment begins with la mi; one note, in practice; but the fourth note of one tetrachord, and the first of another tetrachord. la-mi is the doppel-gänger of music.

[†] The fourth and the sharp seventh are sometimes treated as intruders into the scale. I do not contest the proposition that the old-fashioned scale, shorn of the sharp seventh and the fourth, is the most pleasing to the uncultivated ear. But these are not strangers to the scale; they are exiles merely, who have long since been permitted to return.

[‡] The meaning of this will appear when we come to contrast the Tritonus and the Flat Fifth.

[||] For instance, si fa, and re ♭la, are commonly classed together as "imperfect fifths." But the first is a flat fifth; the second a minor fifth: moreover, as will presently be shewn, the first is consonant; the second dissonant, or even a discord.

[§] Corrupted, partly by the pressing of various languages into one; partly, by the employment of old terms in new meanings. A more extravagantly barbarous jargon than the technology of music is not elsewhere to be found in language.

# CHAPTER II.

## NOMENCLATURE.

*Ignoratis terminis, ignoratur et ipsa Ars.*

In Music, especially, the main cause of confusion has been, insufficient differentiation of words. This part of the subject may be fitly prefaced by an extract from the Kosmos, containing all that need be said concerning the danger of being misled by the use of undefined or inappropriate terms.*

> The confusion between the boundaries of closely allied branches of study has been the greater, because for centuries different portions of our empirical knowledge have been designated by terms which are either too comprehensive, or too restricted, for the notions they were intended to convey, and which have besides the disadvantage of having borne a very different sense in the languages of classical antiquity from which they have been borrowed. The terms of physics, physiology, natural history, geology, and geography, arose and grew into general use long before clear ideas were entertained of the diversity of the objects which those sciences ought to embrace, and consequently of their respective limits. Such is the influence of long habit upon language, that in one of the nations of Europe most advanced in civilization, the word "Physic" is applied to medicine; and in a society of justly deserved and universal renown, writings on technical chemistry, geology, and astronomy empirically treated (all branches of purely experimental science) are classed under the general title of "Philosophical Transactions." The attempt has often been made, and almost always in vain, to substitute new and more appropriate names for those ancient terms,—vague, it is true, but which, however, are now more generally understood.
>
> Vol. I., p. 44.

In Music, also, the attempt would probably be made in vain. To carry out the scheme in full integrity, it would not suffice to proceed by occasional and disjointed emendations. A new series of terms would have to be evolved,—homogeneous, coherent, bearing affinity, so far as may be, to each other, like those composing the admirable nomenclature of modern Chemistry. But this would amount to the creation of a new language, which musicians, a very few excepted, would not take the trouble to acquire.

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* Objection is taken only to the Vocabulary; not to the pictorial representation of musical creation on the stave. This is beautifully adapted to its purpose. All attempts to substitute a less complex notation, unless for the more simple forms of music, have failed.

A complete reform must therefore be reserved for a more advanced phase of the science. For the present, we must rest content with indicating the main sources of verbal confusion, and with proposing a few necessary amendments to the technical vocabulary; such only as will enable me to express my meaning with precision enough to ensure its being understood. The immediate object is to make the most of the existing vocabulary; not condemning accepted terms for mere malformation, or even for etymological absurdity, but only where likely to *mislead.*

The causes of confusion in the Science have been already shewn. We shall now point out some anomalies in the technology of the Art; enough at least to justify moderate emendation, while not departing more than is necessary from established usage.

CADENCE.[*]—To recollect the multiplied names of cadences, is a strain upon the memory. Here are some of them; probably there are more to be gathered :

The perfect cadence; the full cadence; the dominant cadence; the grand cadence; the imperfect, or half cadence; the authentic and the plagal cadences; the deceptive, or inganno cadence; the cadence by surprise; the false-flying, broken, or interrupted cadences; the pathetic cadence; the suspended cadence; the radical, medial, and mixed cadences. The word itself is also used as "organ point,"—the Italian cadenza.

MAJOR, AND MINOR ;—sometimes used in a modal, sometimes in an etymological sense.[†]

TONE :—ecclesiastical mode; also, a chant or melody written in the mode or tone, as numbered in the books,—first, second, or third tone; also, one of the intervals, cadentially true, or false, as the case may be,—a degree, or grade; also quality of sound,—timbre, klang-tint.[‡]

CLEFS, claves, or keys, were originally the names of the notes, "because," says Christopher Simpson, "they open the meaning of every song." Clef, and key, have assumed distinct meanings in English.

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[*] The use of the word itself, cadence, or fall, is not without a certain awkwardness of diction. For the most strongly marked cadence of all,—from the seventh to the eighth of the scale, is by an ascending progression. Possibly the word "accent" might be substituted; borrowing from the vocabulary of Plain-song, in which we find, for instance,—the Grave Accent, the Rising Moderate Accent, the Medial and Acute Accents.

[†] For instance, ♮ mi—ut, the inversion of a major third, is called a minor sixth; and ♭ mi—ut, a major sixth.

When the words Major and Minor come to be applied to tones, the confusion is increased.

Major and Minor modes were formerly called, sharp and flat keys.

Moods, were anciently manners of measuring notes ; as, *ex. gr.*, by four time, or by three time.

The use of musical terms by Shakspeare is frequent, and always correct, *according* to the manner of those times. Many of the allusions are now misunderstood, through the perverse substitution of modern meanings. See Appendix.

[‡] The word proposed by Tyndall. Its adoption would be convenient, but the expression sounds, as yet, hopelessly pedantic. Acclimatization is doubtful.

It would not be easy to induce a violin player to speak of the klang-tint of his Stradivarius. "Timbre," because of the pronunciation, could never be fairly anglicized. "Tone-colour" is creeping into use.

TIME :—now used indiscriminately for rhythm; for pace, or for measure,—called, in the old terminology, proportion.

MODULATION :—in the strict meaning of the word, takes place in every passage from one tetrachord to another. But it is conventionally held to mean, a passage from one octochord to another.

CONSONANCE; DISSONANCE :—Theorists cannot agree upon a definition of the distinction. They still dispute about the nature of the fourth, of the flat fifth, and of the tritonus.

DISSONANCE, DISCORD :—These words are used interchangeably, though the difference be clear, and well defined.

FUNDAMENTAL BASS :—that is to say, a bass composed of primes—a ground-bass, is sometimes confused with thorough-bass,—the basso continuo. "Ground-bass" is itself confused with "a ground,"—a repeated bass.

CHORD :—a chord, according to some writers,* must be formed of at least three notes; according to others, two may suffice.

TONIC, DOMINANT, AND SUBDOMINANT :—often used convertibly with the terms, first, fifth, and fourth of the scale.†

PERFECT INTERVALS, IMPERFECT INTERVALS :—classed as alterable, and inalterable. But the third is inalterable when played upon the dominant,‡ and the fifth is alterable when played on the second or sixth of the scale.||

HALF-TONE : §—confused with the little tone, or tonule; that is to say, mi—♭mi, with mi—fa.

INTERVALS :—The fifth on the seventh of the scale is indiscriminately termed, diminished, false, minor, defective, imperfect, flat, or semidiapente.

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* For instance, "A *chord* is the simultaneous sounding of several different notes, selected according to certain fixed principles and rules." Sir F. G. Ouseley.

Albrechtsberger, on the contrary, uses the word interchangeably with "concord." cxxxii. Rule 1, example 582.

† For instance, G, in the scale of C, when bearing a sixth, is not a dominant; neither is F, bearing six four two, a subdominant. The term subdominant is clumsy, but useful. It will presently be shewn that F of the ascending scale is an upper tonic. The words supertonic, mediant, submediant, &c., are pedantic rubbish.

For instance, mi, third of the scale, is in no sense a "mediant." It is either the upper note of one tetrachord,—b, c, d, e; or the lower note of another tetrachord,—e, f, g, a. It is also the upper note, not the middle note, of the triad in its primary form,—g, c, e. The subdominant, so called, is distinctly tonic, not dominant, in æsthetic character.

When we come to diminished and superfluous unisons, the absurdity rises to a climax. It is not in Ireland alone that bulls are made.

‡ When this third is minorized, the bass note which seems to be a dominant, is not a dominant. It is in this quality of inalterability, that the old fashion of ending a minor strain with a major chord took its rise. For the old cadence was plagal, *i.e.*, from a tonic to a dominant note.

|| The second of the scale bears either a major or a minor fifth. The flat fifth is played on the seventh of the scale, and is inalterable.

§ The term itself ought to be got rid of, as tending to mislead. But it has struck too deep a root.

The fourth on the fourth of the scale is called, augmented, superfluous, sharp, or tritonus.

The sixth on the fourth of the ascending scale has been called dissonant when accompanied by the fifth.*

Leading note :—The term "leading note," is unduly restricted to the sharp seventh,—*i.e.*, to the third upon the dominant,—the *nota sensibilis*. But there are two leading notes; si, *i.e.*, bequarre, and fa, *i.e.*, bemol; the one leading upwards, the other downwards. Bemol might be distinguished as the counter-leader.

Quarter tone :—used by some writers interchangeably with enharmonic tone, komma, and δίεσις (diéze).

Octave :—used indiscriminately as an eighth note, and as a gradual succession of eight notes; confused with octochord.

These are but some of the more glaring instances; † mention of others must be postponed to a development of the Cadential System.

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* The ninth might as well be termed consonant, when accompanied by the seventh. It will presently be shewn that the fifth, not the sixth, is the dissonant note.

On the other hand, the extreme sharp sixth, in reality discordant, is deemed to be a concord.

† For instance, the equivocal use of "mi;" the old place of mi being not quite yet forgotten, as in the expression, "mi contra fa." Or, again, in the equivocal use of "mi contra fa" itself, which is held to mean, not only bequarre against bemol,— a false relation of the tritonus, but also ♭ mi against mi,— the minor third upon ut against the major.

It may be here observed that the introduction of the name "si" completed the supercession of the tetrachordal by the octochordal system.

# CHAPTER III.

## RECTIFICATION OF TERMS.

More than two centuries ago, quaint old Pepys, a musician born and a thinker to boot, delivered his mind in these pregnant words:—

> To which, what I would now recommend to your giving the same regard to, with the particulars therein named, is first Music—a science peculiarly productive of a pleasure that no state of life, public or private, secular or sacred, no difference of age or season, no temper of mind or condition of health, exempt from present anguish, nor, lastly, distinction of quality, renders either improper, untimely, or unentertaining. Witness, the universal *gusto* we see it followed with, wherever to be found, by all whose leisure and purse can bear it; while the same might, to much better effect, both for variety and delight to themselves and friends, be ever to be had within their own walls, and of their own composures too, as well as others—were the doctrine of it brought within the simplicity, perspicuity, and certainty, common to all other parts of mathematical knowledge, and of which I take this to be equally capable with any of them, in lieu of *that fruitless jargon of obsolete terms*, and other unnecessary perplexities and obscurities, wherewith it has been ever hitherto delivered, and from which, as I know of nothing eminent, or even tolerable, left us by the ancients, so neither have I met with one modern master (foreign or domestic) owning the least obligation to it, for any of their now nobler compositions; but on the contrary, charging all (and justly too) upon the happiness of their own genius only, joined with the drudgery of a long and unassisted practice.

The fault was patent, even then; yet from that day to this, no serious attempt at amendment has been hasarded.

"Half the perplexities of man," says Max Müller, "are traceable to obscurity of thought, hiding and breeding under obscurity of language."

Our first endeavour should therefore be, to disentangle the science of music from its vocabulary; to clear away confusion, so far as may be, by attaching a preciser meaning to the terms and signs employed. Nevertheless, in the absence of any definite system for the application of names, we cannot venture to disturb the existing nomenclature more than is necessary to effect the purpose. "A change of nomenclature," says Max Müller, "generally produces as much confusion as it remedies."

We can at all events amend, though we cannot completely cure.* The terms, unless a nomenclature entirely novel be devised, must still, to a large extent, remain liable to arbitrary use, and therefore indistinct.

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* It will be found that amendment has been confined to terms that absolutely *mislead;* letting alone those that are merely unmeaning, awkward, or ill-compounded. But we shall anglicize as far as the present huddling together of many tongues will allow.

For instance, the words consonance and dissonance. We cannot well exclude them from the vocabulary; yet there is no essential difference between the two.[*] Where shall we draw the line of demarcation between these two classes of sounds, which merge in each other? Where do concords end, and dissonances begin? The third is more dissonant than the fifth, and the seventh than the third. What is the seventh after all? It is commonly called a dissonance; but why? It should rather be termed the Appellative Concord.[†]

It has been said that the gap between concords and dissonances is filled up by intervals which partake of either character,—by the flat fifth and the tritonus. But these intervals, which (as contrasted with prime intervals), may conveniently be termed sectional, being each bounded by overtones, instead of by one prime and one overtone, are plainly distinguishable from those which they have been supposed to connect.

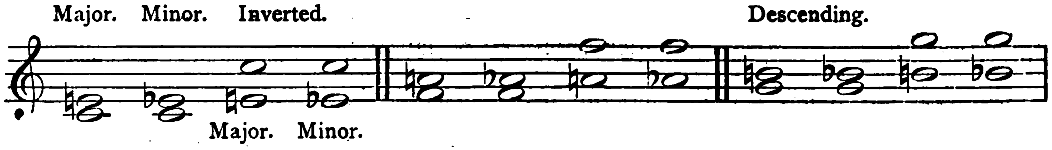
Certain amendments and restrictions of vague or unduly comprehensive terms may be noted at once. Others, needing too much prefatory explanation, will be made as occasion shall arise, following the development of the scheme proposed.

"Major," and "Minor," will be used in a modal sense only; not in an etymological, sense, as greater, or lesser.

Nothing has been more pregnant with confusion than the ambiguous treatment of these terms, used sometimes conventionally, in a modal sense; sometimes etymologically, in an extensive sense, implying width or span. From this comes the strange anomaly that the minor third, ut—♭mi, inverted becomes (in common parlance) a major sixth, ♭mi—ut. Inversion cannot change the nature of an interval.

Those notes of the scale which are capable of being minorized will be designated as movable notes.

Minor notes are thirds lowered by half a tone, based on tonic primes. Tonic primes are the first and fourth of the scale ascending; the fifth and first descending.[‡] Therefore mi and la may be flattened in the ascending scale;—with the addition of si flattened in the descending scale.



Observe, the ♮si, of the ascending scale, is not major, but sharp. This by way of anticipation.

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[*] For practical purposes. In theory, a fine-drawn distinction, originally propounded by Helmholz, is held to exist:

"In scientific language, it may be stated that the beats and dissonances vanish when the difference between the two rates of vibration is O; that the dissonance is at its maximum when the beats number 33 per second; that it lessens gradually afterwards, and entirely disappears when the beats amount to 132 per second."—Tyndall on Sound; Lecture viii.

Thus leaving no interval absolutely consonant, but the octave. To treat the fifth and the third as dissonances would overthrow the whole fabric of what is called "thorough-bass." The object of this Treatise is not to destroy, but to amend.

It should be observed, however, that the doctrine propounded by Helmholz has not yet obtained universal acceptance.

[†] A concord that is necessarily transitive; needing resolution.

[‡] That is to say, according to the ordinary canon.

Fundamental bass notes (root-notes or generators) will be called Primes.

Harmonic notes, Overtones.

Harmonic intervals,—*i.e.*, those given by the monochord, will be classified as Prime, and Sectional. Prime intervals are those reckoned from the root of the chord: sectional intervals are those reckoned from one overtone to another.

The seventh of the ascending scale will be called "bequarre," or "be." The fourth of the scale, descending, will be called "bemol."

Intervals of which the upper note is bequarre, are sharp, or leading intervals.

Intervals of which the upper note is bemol are flat intervals. These also are leading intervals, in a reverse direction, and will be distinguished as counter-leading intervals.

Diminished intervals are minor intervals based upon bequarre.

Augmented intervals are inversions of the diminished.

Superfluous intervals, so called, are abnormal; they are merely *distances** between two notes having no harmonic connection.

Intervals of anticipation and of retardation, commonly so-called, are also abnormal. But they must continue, for convenience, to be treated as intervals, until a complete analytical nomenclature shall have been devised.

Dissonance must be distinguished from discord. Dissonances are the upper overtones on the dominant,—namely, the ninth upon the clavier, the eleventh, and the thirteenth.† A discord is a note of anticipation or retardation,—not belonging to the chord.‡

Discords by suspension should rather be termed, discords by prolongation or protraction.

The term suspension may be perhaps maintainable, *desperatâ intelligentiâ*, but is confusedly used; the distinction between the suspending note and the suspended note being not always brought to view. To "suspend," is to "underhang;" also to maintain in suspense. Now the note for which we are waiting—*i.e.*, held in suspense, is not the discord, but the concord on which the discord resolves. The suspended note creates no discord, though the suspending note happens to be discordant to something else.

Discord by prolongation, or "holding discord"—it is always worth while to get back to honest vernacular, where possible—is completely descriptive, and avoids the distinction that has been drawn between "suspension," and "retardation."

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* An interval must be distinguished from a mere distance. An interval has a *status*,—a home,—a position. A distance, is a houseless Bohemian. A distance is between two notes which bear no relation one to the other,—ἄλογοι. A use will presently be found for the distinction; though it be not quite accurately expressed; every interval being a distance, though every distance is not an interval.

† Sometimes called, "fundamental discords."

‡ Dissonances and Discords alike require resolution; but discords only necessarily require preparation.

The seventh upon the dominant* is the transition note from consonance to dissonance. It will be termed "the Appellative Concord."

The first, fifth, and fourth of the scale may be called tonic, dominant, and subdominant only when prime, accompanied by the fifth.

g, accompanied by $\begin{smallmatrix}6\\4\end{smallmatrix}$, is an overtone; merely the fifth of the scale, and not a dominant. f, accompanied by $\begin{smallmatrix}6\\4\\2\end{smallmatrix}$, is an overtone; the seventh to prime G, and not subdominant.

The term subdominant is clumsy, but useful in the present state of the vocabulary. It shall presently be shewn that Fa, in the ascending scale of Ut, is in reality the Upper Tonic.

To mark the distinction between the dominant and the fifth of the scale, overtone to the first, the dominant will henceforward be termed "Do-sol;" or for shortness, "Do."† The fifth upon the tonic, "sol." Do-sol, being prime, is accompanied by 5; sol, being an overtone, by 6.

The seventh of the scale ascending will be called bequarre; the fourth of the scale descending bemol. These are the characteristic notes.

From mi to Fa, or from si to Ut, is a little tone, or tonule. The half-tone, so called, is from mi to ♭ mi,—the difference between a major and a minor third.

"Common chord," *i.e.*, *accord parfait*, usually so named when upon the tonic, is a misnomer on the dominant. The chord upon the tonic is a triad; that upon the dominant a tetrad. $\begin{smallmatrix}5\\3\end{smallmatrix}$ upon the dominant is an incomplete chord, mutilated by omission of the seventh; not a perfect triad, but an imperfect tetrad.

The Diapente ‡ must be distinguished from the Pentechord, or lesser Diapente.

The Diapente is, ut, re, mi, fa, sol; followed by the Diatessaron,—sol, la, si, ut. The pentechord is,—bequarre [si], ut, re, mi, bemol [fa].

For "enharmonic change," substitute "synonymous change;" *i.e.*, by double treatment of what seems to be one and the same note.

Further amendments will presently be suggested; some of those already offered are in anticipation of what will presently be made good.

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* The harmonic seventh is commonly supposed to find no place in music. It shall presently be shewn that it has to be accepted, "for better for worse." It may be as yet "unselected;" but to what is called, "natural selection," we had better prefer implicit acceptance of what nature has supplied to us.

† The short for dominant. Do, as an equivalent for Ut, is a mere invention of the singing masters, for easier vocalisation. If they object to the time-honoured Ut, let them fall back upon the syllables introduced by Graun,—da, me, ni, po, tu, la, be.

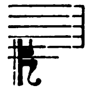
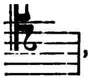
‡ The ancient uses of words, though borne in mind, are not considered in this Treatise; the present object being, to treat of music as it is, and to preserve as much as possible of the existing nomenclature. For instance, the word dominant has been used according to its existing, and not to its original meaning. The word "pentechord," as herein used, is novel; but of necessity.

# CHAPTER IV.

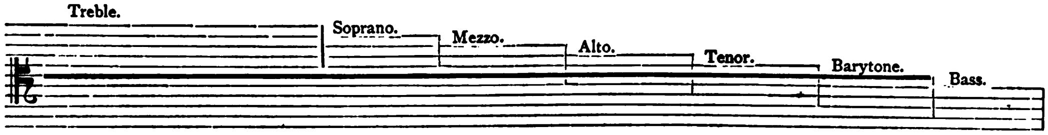
## NOTATION.

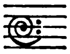
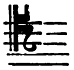
The system of notation now in use, slowly evolved during the course of many centuries, can hardly be surpassed, as a picture, for giving facility to sight playing. Two more not very material improvements are suggested.

i. The disjunction of the ambiguous, or two-faced symbol, called a natural, at present used to serve two purposes—raising, or lowering by half a tone. It would be convenient, for quick reading, to contrast a flattening natural, ♮, with the sharpening natural, which will retain its present form.

ii. The substitution of  and of , C clefs, for the usual G and F clefs.

Thus, one clef would govern the whole of the great eleven line stave, from which the several five line sections are cut off.



It thus appears that the G and the F clefs seem needful, because there is no place for middle C on either of the extreme five line staves. The placing of the C clef on a leger line supplies the deficiency. From this it likewise appears that the use of  to indicate the barytone clef is unsymmetrical;  being the more orderly designation.

The use of the C clef in this form, giving no trouble whatever to executants, would tend to the more general use of the remaining forms, thus getting rid of the awkwardness of tenor parts written in the G clef, to be sung an octave lower; an unwise concession to the laziness of half-educated vocalists, and an eyesore to those who are capable of reading four parts at once.

There is some uncertainty in the English use of the foregoing terms. The distinction of "treble" (called by the Italians "chiave di violino") from "soprano" is awkward, and not always observed. "Alto," the highest register of a man's voice, is frequently confused with second treble, a low register of a woman's voice.* Tenor† and barytone have become etymologically incorrect, but do not mislead.

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* Contralto, for second or third treble, is sufficiently absurd. If retained at all, it should be used to denote a peculiar quality of voice, without reference to pitch.

† The old English word, "mean," might be revived in the place of tenor. "Three men song-men all, and very good ones too; but they are most of them means and basses." "Winter's Tale," Act iv. It would be well, as a general rule, to anglicize as far as possible our polyglot musical vocabulary; but it must be admitted that there are many Italian terms, mainly of expression, which could not be rendered in English words without clumsy periphrasis.

For vocal score the most convenient terms would be, in English—First and second trebles; countertenor, tenor and bass.

For other than English—Soprano, mezzo, alto, tenore, basso.

There are many terms in our English vocabulary which would be the better for amendment, but which are scarcely worth notice, because they do not generate erroneous ideas. Yet the strangeness of some among them can scarcely be paralleled in any other language. *Ex. gr.*, semibreves—that is to say, half-shorts*; minims, which are not the least; crotchets, which have no hooks; quavers, which I presume to have been originally parish-clerk *fioriture;* demisemiquavers, and even hemidemisemiquavers, One might exclaim with Falstaff, "O for breath to utter what is like thee." The corresponding terms in French—rondes, blanches, noires, croches, double croches, triple croches, &c, are clear and picturesque.

It is convenient to indicate at once certain specialities of notation that will be henceforth adopted in this treatise. Being descriptive they will tend to the saving of many words.

Primes will be indicated by capital letters; for instance, C. Overtones by small letters; for instance, e, or a.

For tonic primes, ⬭; for dominant primes, ◇; for tonic overtones, ●; for dominant overtones, ◆; for replicates to primes, ○ and ◇.

For tonic primes indicated, —, not played, w.

For dominant primes so indicated, M.

Bequarre and bemol will be respectively designated by +, and α.

Ut, re, mi, Fa, Do, la, bequarre, ut, with si for bequarre, and bemol for fa in the descending scale, will be treated as movable; Ut being always the first in every key. These shall be called "scale notes."

c, d, e, f, g, a, b, c, will be treated as fixed notes, denoting absolute pitch, as on the clavier, and not position in the scale; in other words, according to ordinary use. The corresponding sharp and flat notes are of course included. These shall be called "stave notes." The following is a convenient mode of distinguishing the octaves.

$c_{|||}$ .... $c_{||}$, $d_{||}$, $e_{||}$, $f_{||}$, $g_{||}$, $a_{||}$, $b_{||}$, $c_{|}$, $d_{|}$, $e_{|}$, $f_{|}$, $g_{|}$, $a_{|}$, $b_{|}$, c, d, e, f, g, a, b,
$c^{|}$, $d^{|}$, $e^{|}$, $f^{|}$, $g^{|}$, $a^{|}$, $b^{|}$, $c^{||}$, $d^{||}$, $e^{||}$, .... $c^{|||}$ &c.

Thus avoiding the unsightly introduction of capital letters. In description, the terms eight foot, four foot, two foot octave, &c., will be used.†

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* Now the longest. In like manner *demijean*, the largest bottle made in France, comes from the Italian *dimidiano*, half measure.

† The unmarked letters belong to the two foot octave. $c_{|||}$, as a distinctive mark, is better for printing than $\underset{\equiv}{c}$, as not requiring spacing out.

# CHAPTER V.

## THE MONOCHORD.

The foregoing observations are introductory. Let us now begin at the beginning, with the Monochord.

For avoidance of many words, acquaintance with the phenomena of the multiple resonance—of the overtones produced by the several aliquot parts of the vibrating string, is presumed.* The object of this Treatise is not to give additional exposition

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* The fact itself, that in the multiple resonance is the source of European music (for the Asiatic intervals seemingly do not correspond with our own) has been impugned. Some source there must be; and no other source has yet been indicated.

The division of the string, as will presently be shewn, fulfils all the required conditions, satisfying the phenomena.

As the objection, which meets us at the very outset, is forcibly put in the Encyclopædia Britannica [Article "Music,"] the essential passages shall be quoted.

"It was long ago observed that a musical string or wire, capable of rendering a grave and powerful sound when thrown into a state of vibration, produced, in that state, not only a *principal* sound, corresponding to its length, tension, thickness, &c.; but also two audible concomitant and accessory sounds, related to the principal sound by the intervals of a twelfth or double (replicate) fifth, and seventeenth major, or second replicate major third. For example, the fourth string, or largest string of the violoncello, when strongly vibrating, may produce these accessory sounds, or harmonics; which, though feeble in comparison with the principal sound, may, however, be heard by a delicate and attentive musical ear.

"Upon this acoustical phenomenon, Rameau, a French musician, attempted to found his theory of harmony. . . . .

"Dr. Chladni, in his celebrated work, 'Traité d'Acoustique,' expresses himself as follows regarding the theories which we have mentioned:—'It is not conformable to Nature to desire, like many authors, to derive all harmony from the vibrations of a string, and especially from the co-existence of several sounds with the fundamental sound. A string is *only one* species of sonorous body.'

"In many other sonorous bodies the general laws of vibrations, which were not known, are differently modified; consequently, the laws of one sonorous body cannot be applied to that which ought to be common to all. A monochord cannot serve to establish the principles of harmony, but only to give an idea of the effect of ratios. . . . .

"Many authors have regarded the co-existence of sounds comprised in the natural series of numbers (which, according to true principles, is nothing but a particular phenomenon) as an essential difference of what is already known, but, assuming certain facts, and granting certain postulates to modify the deductions which have been already drawn therefrom.

The application of these phenomena to the science of music has been made, up to a certain point, in the right direction. I now propose to take up the line at the point where the deviation begins. But it becomes necessary, for the sake of continuity,

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between a distinct sound and a noise. They have taken this quality as the basis of all harmony, believing that an interval is consonant, *because* the acute sound may be heard along with the fundamental sound. They do not know that, if more than one sound is heard at the same time, that this is nothing more than a consequence of the existence of many species of vibrations; that in many sonorous bodies the series of possible sounds is very different from the natural series of numbers; and that we may produce each manner of vibrations, where there are nodes, without any mixture of other sounds, by touching the nodal points, or lines, which ought to be in motion in other manners of vibrating.

"According to these principles, the perfect minor chord,—if one does not make use of sophisms, would not be consonant; and on the bell or the harmonica, the ninth (4 : 9) would be the first consonance, since it is the first sound which can couple itself with the fundamental sound, &c. Daniel Bernoulli, and La Grange have sufficiently refuted these false principles.

"Choron, in his work on composition, says,—'It has been attempted to deduce the laws of succession from the multiple resonance, or from the sub-multiple resonance. Tartini had hardly discovered this last phenomenon, when he hastened, in order to satisfy the taste of his time, to rear upon it a system, which he gave to the world in a very unintelligible work.' . . . .

"'With the phenomenon of the multiple resonance, of which he had considered no more than the three first terms, Rameau had propped up his theory of the fundamental bass. Without entering more into detail, I shall remark that this phenomenon has no connexion with the laws of harmony. That if one absolutely would apply it to them, it would be necessary, *first*, in order to be consistent, to suppose, at least implicitly, that the sounds of the system are those of the series of aliquots: first absurdity. *Second*, that all the notes of the bass ought to be accompanied by their aliquots, moving in a parallel manner with each other: second absurdity. Every other consequence is illegitimate, and tends, not to give a foundation in nature to the rules of harmony, but to reconcile, as one best can, the phenomena with the rules of harmony, which is a very different matter.'"

These objections are plausible, but of little substantial value.

i. It may possibly be "not conformable to nature to derive *all* harmony from the vibrations of a string;" but the fact remains, and shall presently be made good, that such harmony as enters *into musical use* is derived from those vibrations.

If, "in many other sonorous bodies, the general laws of vibrations are differently modified," the fairer conclusion is, that other harmony, different from that in use, may possibly exist; its laws varying with the aforesaid modifications of the law of vibration. It suffices for the present purpose that from the vibrations of a string, the laws of such harmony as we possess may be deduced. But this is perfectly consistent with an assumption that from a different series of overtones as supplied by other sonorous bodies, a different musical system might be evolved.

ii. It is not necessary to "regard the co-existence of sounds comprised in the natural series of numbers as an essential difference between a distinct sound and a noise." A better distinction has been handed down to us from the time of the Greek theorists—continuity of sound at an unvarying pitch; in the words of Euclid, *φθόγγος μὲν δυν ἐστι φωνῆς πτῶσις ἐμμελὴς ἐπὶ μίαν τάσιν.*

iii. To the objection that "according to these principles the perfect minor chord,—if one does not make use of sophisms, would not be consonant," I reply, that it is a matter of indifference whether the ratio of 6 : 5 (received as that of the minor third) be termed consonant or dissonant. Principles cannot be affected by the arbitrary use of terms; the numerical ratio remains the same, whatever epithets may be applied to it.

It shall moreover, presently be shewn that the expression "Perfect minor chord" involves a confusion of ideas.

bringing all under one purview, to set out, in the fewest possible words, the first elements of a system to which it is proposed to give a fuller development than it has yet attained.

Beginning with the Monochord, we mark upon it the nodes denoting the earlier portions of the series of overtones. With these every theorist is familiar.

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iv. It is not necessary to assume (if I understand M. Choron rightly) that "the sounds of the system are those of the series of aliquots;" that the ♮b, for instance, the fourteenth overtone on a monochord tuned to C, is the ♮b of the scale. Not *all*, as implied, but only a few of the sounds of the series of aliquots, are used. The number is limited by postulate.

v. Neither must we assume that "all the notes of the scale ought to be accompanied by their aliquots, moving in a parallel manner with each other;" although such accompaniment, taking the word in its literal sense, is actually in use, to a certain extent, upon the organ,—not much, perhaps, to the advantage of that instrument. As a matter of fact, the overtones do intermingle with the fundamental sound. But M. Choron would argue, that *therefore* (admitting the premiss) we ought to imitate these notes by fundamental sounds, "accompanying" each note by its own third and fifth. Now to assume that imitations of these overtones, by way of accompaniment, would coalesce with the prime, would be much the same as assuming that because the elementary, or base colours of the spectrum combine into white light, the corresponding colours, mixed upon a painter's palette, would produce white paint. One essential condition, purity, is wanting in either case.

vi. The writer of the Encyclopædia article says:—"The total vibration which gives the gravest sound of the string, can by no means co-exist with the vibration of the aliquot parts of the string, &c."

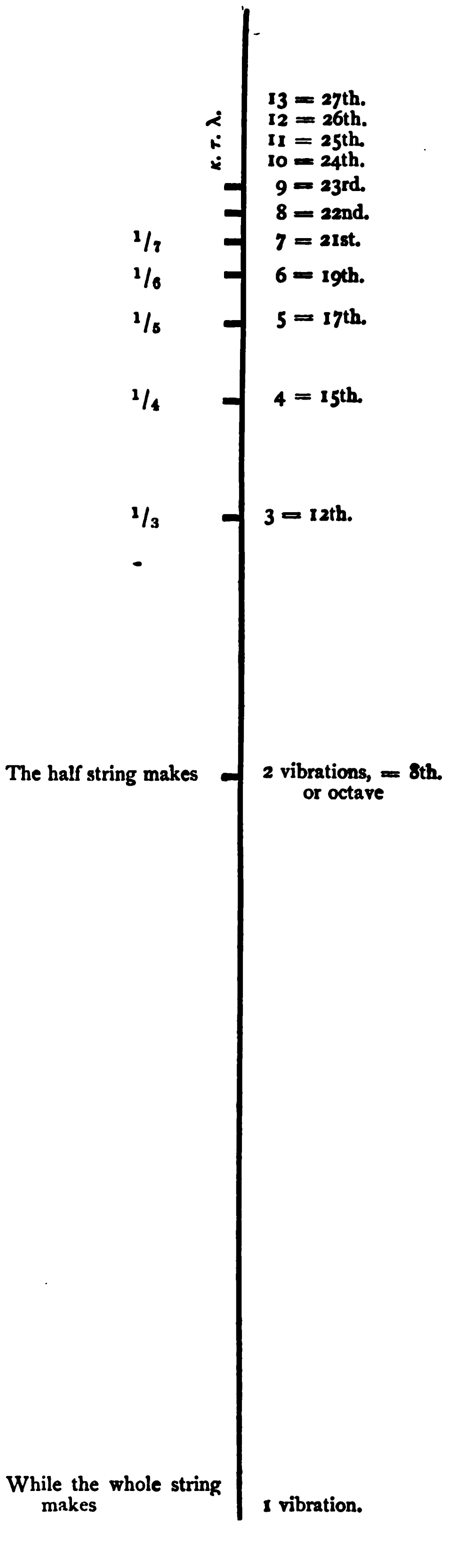
Contrast "Tyndall on Sound," section iv. "In this case, however, besides oscillating in parts, the rod oscillates as a whole, the partial oscillations being superposed on the large one." It must be admitted that Tyndall's, or rather Helmholz's dictum has not passed unchallenged; but even should the overtones *follow* the fundamental sound, succeeding each other in the order of pitch, they would not less reasonably supply a basis to the science of music.

It would seem, however, that the means exist, though not available at pleasure, of proving that the partial tones do actually co-exist with the fundamental tone. We are told, I scarcely venture even to make mention of what is so hard to believe, that some performers have the rare faculty of drawing more than one tone from a tube. There is a recorded instance of a player who could produce double notes on flute, the reference to which I have mislaid. But in the memoirs of Hector Berlioz,—a man unlikely to be deceived in his perception of sound, mention is made of the extraordinary fact of a trombone player who could cause to be heard a four note chord. The passage is here transcribed, and commended to the consideration of experts.

"Les trombones [Stuttgard] sont d'une belle force; le premier (M. Schrade), qui fit, il y a quatre ans, partie de l'orchestre du concert Vivienne, à Paris, a un véritable talent. Il possède à fond son instrument, se joue des plus grandes difficultés, tire du trombone-ténor un son magnifique; je pourrais même dire, des sons, puisque il sait, au moyen d'un procédé non encore expliqué, produire trois et quatre notes à la fois, comme ce jeune corniste [Vivier] dont toute la presse musicale s'est récemment occupée à Paris. Schrade, dans un point d'orgue d'une fantaisie qu' il a exécutée en public à Stuttgard, fait entendre simultanément, et à la surprise générale, les quatre notes de l'accord de septième dominante du ton de si♭, ainsi posées : $\left\{\begin{matrix}\textit{mi}\flat\\ \textit{la}\\ \textit{ut}\\ \textit{fa}\end{matrix}\right\}$. C'est aux acousticiens qu'il appartient de donner la raison de ce nouveau phénomène de la resonnance des tubes sonores; à nous autres musiciens de le bien étudier et d'en tirer parti si l'occasion s'en présente.

"*Mémoires de Hector Berlioz.*" Vol. ii. p. 25.

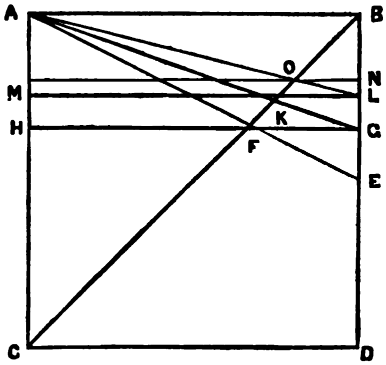
To revert to the *a priori* objections. They could not well be passed over, when supported by authority so high as that of Choron. It will however scarcely be maintained that music is not subject to the laws of physical science, and it is for us to trace the operation of those laws. It is to be observed that those who reject this particular solution of the problem, do not pretend to shew, so far as I am aware, how else it can be solved.



Let us here take occasion to renew an interesting method, seemingly obsolete, not being mentioned in the ordinary books, of dividing a given line into aliquot parts. It is taken from Meibom's preface to Aristides Quintilianus De Musica [Septem Scriptores], and is prefaced by these words :—

Reliqua diagrammata, quœ ad paginas 117, 118, 119 spectant, ex ingenio restitui. Illorum unius occasione, quod Helicona vocavit antiquitas, cujus figuram ex Ptolemœo, Pag. 314 adposui, egregium aliquod problema inveni, quod cum hactenus a nullo quod sciam, demonstratum sit, ob insignem ipsius usum hic adponam.

Datam rectam lineam in quotcunque partes œquales secare continua progressione.

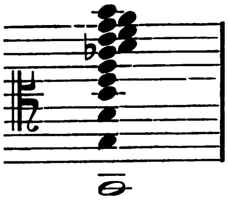
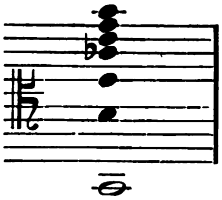


Data sit linea recta B D. Hanc in duas œquales partes secabimus in E, per 10 propos. I Euclidis. In tres autem partes sequenti methodo. Quadrato A B C D à data linea B D descripto, et bifarium sectâ B D in E, ducatur linea A E, et diagonius B C, quœ priorem secat in F.

Per hoc punctum ipsi A B vel C D parallela agatur H G. Dico F H duplam esse ipsius F G, id est, F H bessem totius B D, et F G trientem. Quoniam enim triangula C F H et A F H œquiangula sunt triangulis B F G et E F G, utraque utrisque ; erit ut C H ad H F, ita B G ad G F. Item, ut A H ad H F, ita B G ad G F. Item, ut A H ad H F, ita E G ad G F.

Ideoque per 24 propos. V Elem., composita prima et quinta A C erit ad secundam H F, ut composita tertia et sexta B E; ad quartam G F et permutando, ut A C ad B E ita H F ad G F, quod erat demonstrandum.

Porro ipsi G F œqualis est B G, per 24 propos. VI. cui œqualis ponetur, a G progrediendo ad D. per 2 propos. I. Constat itaque propositum. Similiter in quatuor partes secabimus lineam B D, ducendo primum lineam A G, et deinde parallelam M L. Erit enim K L quadrans totius B D, et eodem modo B N pars quinta. Adeoque continuando eandem operationem in infinitum, in quotcumque partes œquales proposita linea B D secabitur. Quod si ipso actu in tres œquales partes propositam lineam secare velimus, bisecta A B, exempli gratia in R,ducemus lineam C R, secans lineam H G in S. et habebimus tres trientes, G F, F S, S H. quod requirabatur. Eadem autem sectione lineœ B D, etiam linea B C in partes quotcumque secatur, uti est evidens. Vale, Lector benevole, et labore nostro fruere feliciter. Amstelodami XXI Martii, Anno CIↃ IↃC LII.

The parts of the string, marked off upon the diagram, are equivalent* in musical notes (assuming C for prime) to  or, omiting replicates, to  The series of overtones is manifestly infinite. For practical purposes, it is arrested at a', the twenty-seventh from the prime. Not arbitrarily, for cause shall be shewn, sufficient in my opinion; but, *ex abundanti cautelâ*, the arrest shall be also provided for by postulate.

Bear in mind that every note supplied by an uneven division of the string is a new note; and, if it has to be adapted to the clavier, must be forced into place. Also, that new notes need new names, which will be presently supplied.

But, it may be argued, this forcing into place is proof sufficient of a faulty system. What if it be said in answer that the whole system of music beyond the tetrachord is a makeshift. Judging from results, a very happy makeshift—

"They say, best men are moulded out of faults."

One of the main objects in this Treatise is to shew how far music departs from the rigour of system; and how much it is the creature of compulsion.

We have now, in vernacular parlance, to take the bull by the horns, dealing boldly with the question of supplementary overtones. The scientific treatment of music has been cramped throughout by superstitious worship of the common chord. Our views are steadily broadening; but we have yet to reach the frank acceptance of the three upper dissonances, still but half acknowledged, though many have coquetted with them. By their aid only can the dissonant chords, among which are the Great and the Neapolitan Sixths, be accounted for.

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* Equivalent, when made so by temperament, more or less strong. Some prefer writing f, given by the eleventh part of the string, as ♯f. In strictness of speech, it is neither one or the other. The same of a, which by some is written ♭a.

The times have been when the seventh on the dominant was treated, not as a dissonance, but as a discord, needing preparation as well as resolution. That restriction has been long since got over. The seventh is no longer treated as "a note of addition," but almost as an essential note of the Tetrad, leading to resolution on the Triad. The qualifying "almost" is used advisedly; for even yet the true flat seventh, bemol—the sixth overtone—is not acknowledged; Fa, subdominant, being compelled to do duty for it. Now bemol is to Fa as 63 to 64.

The usual limitation of our musical resources—limitation in theory, for practice makes bold with them all, is due to the persistent ignoring of the real flat seventh, which, in turn, is most probably the result of fixing the attention too closely on the ascending scale, in which the flat seventh, resolving downwards, finds no place.

The uses of the three remaining notes of the Great Chord remain for future consideration.

Let us now present the Monochord in another form; breaking up the series of aliquot parts into octave divisions, as follows:

### FIRST OCTAVE.

| | | |
|---|---|---|
| If 1, the whole string, gives | the half string | 1/2 |
| C | will give | c |
| the 1st of the Scale | | the 8th |

### SECOND OCTAVE.

| | | |
|---|---|---|
| 1/2 | 1/3 | 1/4 |
| c | g | c |
| 8th | 12th | 15th |

### THIRD OCTAVE.

| | | | | |
|---|---|---|---|---|
| 1/4 | 1/5 | 1/6 | 1/7 | 1/8 |
| c | e | g | ♭b | c |
| 15th | 17th | 19th | 21st | 22nd |

### FOURTH OCTAVE.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/9 | 1/10 | 1/11 | 1/12 | 1/13 | 1/14 | 1/15 | 1/16 |
| c | d | e | f | g | a | ♭b | ♮b | c |
| 22nd | 23rd | 24th | 25th | 26th | 27th | 28th | 29th | 30th |

### FIFTH OCTAVE.

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/16 | 1/17 | 1/18 | 1/19 | 1/20 | 1/21 | 1/22 | 1/23 | 1/24 | 1/25 | 1/26 | 1/27 | 1/28 | 1/29 | 1/30 | 1/31 | 1/32 |
| c | ♯c | d | ♯d | e | * | f | ♯f | g | ♯g | a | * | ♭b | * | ♮b | * | c |
| | | | | | Quarter Tone. | | | | | | | | | | | |

Observe, again, that no note signified by an uneven number is a replicate to any other note; and that therefore each such note, after $^1/_7$, is new and only approximate to the stave note set under it.

That the fourth octave gives the Henneachord; which, mutilated by the omission of ♭ b, has been by some erroneously substituted for the Octochord.

That a portion of the fourth octave, though unacknowledged, is actually and practically in use; not indeed as scale-notes, but as what in this Treatise are termed, chord-notes.

That the fifth octave is useless for musical purposes.

Overtones are commonly classed as consonant, and dissonant. But the dividing line between the classes is arbitrarily drawn.

The classification is convenient; but it can only be said, with exactitude, that each successive overtone is *less* * consonant than that which preceded it.

From this it results,—

i. That overtones stand more in need of preparation as they rise.†

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* Let there be no mistake about this,—that in the attempt to reduce the science to its elements, and, having found them, to deduce again therefrom, we are met at the outset by a difficulty which debars us from the precision and completeness of mathematical demonstration. We find ourselves involved *ab initio*, with a *sorites*. The *question of degree* pursues us throughout, nor is there any escape from it save by postulates, or by the drawing arbitrary lines of demarcation under guidance of the ear. Not only are we at a loss to find an essential difference (unless that suggested by Helmholz be accepted) between consonance and dissonance, but also between appellative and non-appellative harmonics; between dissonances requiring preparation (at least, according to the teaching of the schools), and those which are content with resolution? Even modulation introduces a question of degree, there being no sufficient cause, except convenience, why the term should be restricted to the transition from one octochord to another; there being, in fact, modulation in the transition from one tetrachord to another; as is made manifest in the harmony of the descending scale.

† As they rise, from the seventeenth or third. Here again, we fall in with a question of degree. In such questions, the only arbiters are the great masters, by whose practice we must be guided, as in equity law by precedent. The difference in practice between the masters of the strict school, and those of the free school, must be allowed for. The former treated the seventh on the dominant as a discord, by way of suspension; the same note is now used as preparation to a discord. Examples are abundant of all the dissonances,—the ninth, eleventh, and thirteenth, freely taken without preparation. For discords, preparation of one note or other seems imperative.

There are some who make short work of doubtful questions by referring all to the decision of the ear. Whose ear, they are careful not to say. It is true indeed that rules were originally made under guidance of the ear; but many of these are subjects of dispute. Now there could be no dispute, but for the fact that the ear is an uncertain monitor. Where the appeal is made to the judgment of the ear, a remarkable discrepancy of decision is found, as shewn in the varying laxity or strictness of rule, and in the various questions that still remain unsettled. How could the dispute have endured (a stumbling block to myself when a tyro) "*della doppia natura del quarto*,"—how could it have remained a question whether the flat fifth be consonant or dissonant,—or whether the consecutive fifths produced by the

ii. That they become more unfit for doubling, as they rise.

iii. That they become more and more appellative as they rise; The seventh and succeeding overtones being so strongly appellative, that resolution becomes imperative.*

iv. That they represent their prime less and less faithfully as they rise.

Of these overtones, only the four first, c, g, e, and ♭ b are scale notes; and ♭b only in a descending scale. The following three, d, f, a, are chord notes, and of comparatively infrequent use.

Attention has been already called to the fact, that of the infinite series of overtones, only the first seven, if counted exclusively of replicates, signifying the eighth, twelfth, seventeenth, twenty-first, twenty-third, twenty-fifth, and twenty-seventh from the root are adopted. The others are not in use. The arrest at a particular point might seem to be arbitrary, demanding a postulate† for confirmation. And a postulate is claimed accordingly. But, without this, cause, probably sufficient, can be shewn. The next in succession—♮b, the twenty-ninth note from the prime, cannot be brought into use,

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resolution of the augmented sixth on the chord of five-three be tolerable, if "the ear were able to pronounce an unqualified decision?"

Again,—do all ears judge alike? setting aside the essential difference, (judging from results), between the perceptions of the Asiatic and of the European ear, is it to be assumed that all ears are equal in intelligence? Is a doubtful progression to be referred to universal suffrage of ears? How often does a pupil defend an error in counterpoint by the declaration that "it does not hurt his ear,"—that is to say, his own ear, never stopping to consider whether it be offensive to that of the master?

Not only the more or less fine organization of the ear, but also the training of the ear must be allowed for. The *tastes* of the ear may be changed. The taste that was naturally simple, inclining to purity of harmony, may be taught to affect complicated chords, with ceaseless modulation,—not unhappily termed, in technical parlance, "the pepper box." The ear may be corrupted, like the palate, which is taught, first to bear with stimulants, and then to desire them. To borrow the words of the Ettrick Shepherd [Noctes Ambrosianæ:—Edinburgh Fiddlers], "There's nae saying what a man's lugs may be brought to by evil education."

Beyond all, let us not disguise from ourselves the unpleasant fact, that music, of any rank above that afforded by the uncertain sounds of the Æolian harp, depends for its very existence upon the imperfection of the human ear. The very continuity of sound, to begin with,—or, rather, the impression of continuity, arises from this imperfection. It is in fact a deceiving of the ear, which loses perception of the intervals of silence between the pulsations of sound, even as the eye is deceived by the revolution of a firestick.

From the imperfection of the ear, arises its tolerance. Music is in fact a series of compromises with the ear, which accepts two different notes as one and the same, provided that they sufficiently resemble each other,—*i.e.*, that the difference in pitch, though appreciable, be not too great. We shall presently have to demand as a postulate, that notes differing from each other only by a komma, are equivalent.

Through tolerance, the ear does not revolt against what is called the "Double treatment" of a note. Consequently, if we figure to ourselves a state in which our organs of sense shall be perfected, music, at least for us, will then cease to exist.

The object of this Treatise is, to remove all questions of degree from the uncertain arbitrament of the ear, and, as imperfection must remain, to lay down rules for its measurement, wherever it occurs. Such measurement to be a guide to its toleration or rejection.

* To a fine ear, all the overtones, even the first, are appellative;—*i.e.*, calling for a return.

† Postulate. The several demands, made as occasion serves, shall presently be gathered and ranged in order. This may be called pedantry; but it is the most convenient mode of shewing how much can be demonstrated, and how much must be assumed.

having been ousted by another ♮b.* The ♮b of the fourth octave is derived from prime Ut; the ♮b in use is derived from the dominant to Ut.

Now this is at once suggestive of a cardinal change,—of an essential deviation from the course hitherto pursued:—namely, that the cadential notes of the scale,—mi, fa, sol, la, bemol, are derived, not all from one monochord, but from two, tuned respectively as dominant and tonic.

From this point WE SHALL TAKE A FRESH DEPARTURE, essaying to develop what shall be called The Cadential System of Harmony.†

---

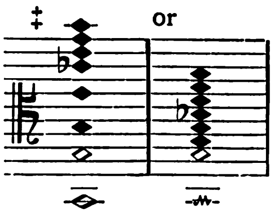
* Another cause for drawing the line of demarcation between the twenty-seventh and twenty-ninth from the root, might be assigned,—that as far as the twenty-seventh, each successive overtone, if replicates be omitted, is in consonance with its predecessor; while the twenty-ninth, ♮b, is discordant to the twenty-seventh, a. But it is pleonastic to insist upon two causes where one is enough.

† Often adumbrated; but never yet, to my knowledge, fully worked out and clenched.

# CHAPTER VI.

## THE CHORD.

The Chord takes precedence of the Scale, as leading to the Cadence, from which the scale is derived.[*]



THE GREAT CHORD is based on a dominant[†] Prime. It consists of all the overtones in use, omitting replicates:—*i.e.*, of the 8th from the Prime, the 12th, the 17th, the 21st, the 23rd, the 25th, and the 27th; which, reduced, are equivalent to 1, 3, 5, 7, 9, 11, 13.

The Great Chord[||] is the parent of *all* other chords. Its most important derivatives are the TETRAD, and the TRIAD.

By omission of the three highest overtones,[§] the Tetrad is obtained. The Tetrad[¶]

---

[*] It has been held, erroneously, that the chord is made up of scale-sounds.

[†] Dominant,—so called because it predominates in the musical sequence, governing the cadence.

[‡] For explanation of the notation that will now be used, see p. 14.

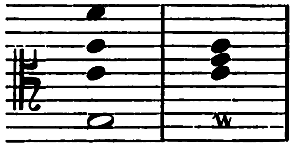
[||] The full chord is not practised, because the ear does not easily distinguish so many simultaneous sounds. It is a question of judgment, rather than of rule, which notes to omit.

[§] These overtones, as also the next below, are commonly termed, "notes of addition." An inverse process ought rather to be used, treating them as notes of subtraction.

[¶] A question might be raised whether the Pentad, including the ninth, ought not to take precedence of the Tetrad. For the ninth is bi-cadential; resolving, if not absolutely on the Triad, at least upon an upper replicate of a Triad note. This will be more fully shewn when we come to treat more specially of the Chord Notes.

differs in character from the great Chord complete, being perfectly bi-cadential, which the other is not.

By further omission of another overtone—the flat seventh, the Triad is obtained. A still greater change of character here takes place. For the Tetrad, containing an appellative overtone, is necessarily transitive :—*i.e.*, it must move on to some other chord, for avoidance of disappointment to the ear, the result of inconclusiveness. To render the chord intransitive, the appellative overtone must be lopped off. The 8th, 12th, and 17th now remain.



This chord, asking nothing to follow, and therefore stationary, is no longer dominant, but tonic.* Being final, it settles the key. Henceforward, chords shall be treated as of two genera :—Dominant and Tonic.†

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* This dictum must be taken with a reservation. § on the dominant does not invariably change its nature. It may remain appellative by collocation, or by association, notwithstanding its having been deprived of the appellative overtone. The two chords must not be confused: § on the dominant, though a chord of three notes, is, in technical parlance, not a Triad, but an imperfect Tetrad.

† For their better presentment to the eye, the dominant chords shall be marked by square, the tonic chords by round notes.

# CHAPTER [illegible]

## THE CADENCE.

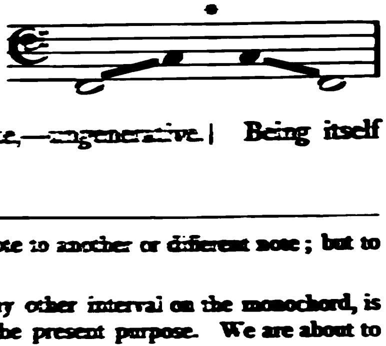
The distinction between dominant and tonic leads to consideration of the Cadence, which connects the Dominant with the Tonic, thus forming—

### THE [illegible] CHORD.

Let us proceed to the Cadence step by step.

The easiest and readiest passage from one note to another* on the monochord, commencing with the prime, is to the harmonic twelfth, equivalent to the fifth. We shall therefore consider it as the most natural, and adopt the interval of the fifth as the basis of operation.†

Assuming such passage to have been made, the ear, after hearing the fifth, desires a return, in order to repose, upon the Prime‡ from which it had received the first impression. For the ear has acquired a habit! This return is called a Cadence, or Fall. In such form the cadence shall be termed, generative.



Let it be now observed, that the fifth is a barren note,—ungenerative.|| Being itself an overtone, it [illegible].

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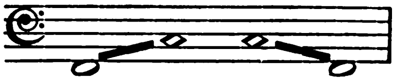
* The passage from the prime to the octave is not from one note to another or different note; but to a replicate, that is, in practice, the same note.

† The reason assigned for adopting the fifth, in preference to any other interval on the monochord, is not so comprehensive as could be wished, although sufficing for the present purpose. We are about to proceed to the formation of a ground-bass (i.e., a bass composed of primes), ranged in a series of fifths. This, as a matter of fact, is that which supplies a foundation to our modern system of music. An attempt has been made to construct a ground bass from a series of major thirds; but the result seems abortive, save to those who take interest in the major apotome, the numerical value of which is unattainable thereby.

‡ Primes, and the replicates of primes, shall henceforward be designated by open notes; overtones by close notes. The distinction in form between dominant notes and tonic notes has been already mentioned. The object is, to make this new system as plain to the eye as to the understanding.

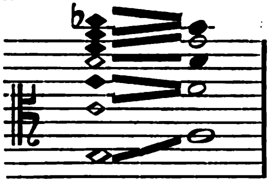
When notes are designated by letters of the alphabet, capital letters are assigned to primes; small letters to overtones.

|| It may here be observed, as an *obiter dictum*, that the fault of overtone stops upon the organ is, that each pipe, being generative, becomes a new prime, with its own attendant henchmen.



For the overtone fifth, substitute a prime in unison with that fifth.* The monad is thus converted into the duad, becoming fertile.

Each note of the Cadence now bears its own set of overtones. In this form it shall be called the Bichordal Cadence.† The prime fifth is dominant; the note to which it falls is Tonic. Rising by a fourth, and falling by a fifth, are equivalent.



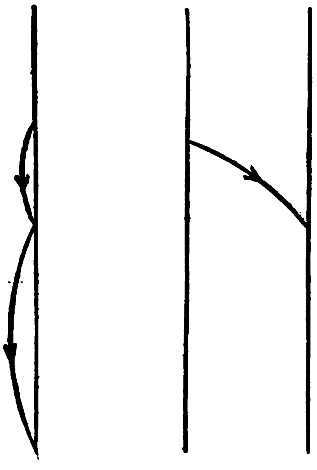
Primes may be *represented* by their overtones :‡ consequently, a prime cadence may be so represented.

The distinction between monochordal and bichordal cadences is important, needing further exposition. A monochordal interval has been defined as the interval between an overtone and its prime, or between any two of the overtones of the monochord. A bichordal interval is that which lies between two Primes,|| or their respective overtones.

From this it results that monochordal intervals afford harmony, which is stationary. Bichordal intervals afford melody, which is progressive sound. The reason is evident: to the first there is but one prime; to the second, two primes. The bichordal interval passes *onwards*, from one prime to another.

It must be admitted, indeed, that a kind of vague melody is obtainable from the one monochord; but this is in the nature of an arpeggio. A " tune " is bi-cadential.

The monochordal and bichordal cadences may be thus depicted.



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* In other words, we operate on *two* monochords, tuned as dominant and tonic respectively. The combination of the two monochords will supply the Double Chord.

Thus arises the Arsis and Thesis; essential to modern music, though not, in any marked degree, to that of the old ecclesiastical style. To dance music, it must of course have been essential, in all times.

† Dichordal would be more strictly correct, but might sound pedantic. We speak freely of Binomials.

‡ This representation affords the resolution of the Tetrad upon the Triad,—the key to the construction of the Scale.

|| Implying two monochords.

# CHAPTER VIII.

## THE SCALE.

The ascending Scale is formed from a succession of bichordal cadences.*

"The Scale of Nature," an expression in common, but various use, is a misnomer as applied to the Diapason, rising in gradual progression. There is no scale of nature, save that afforded by the succession of overtones on the monochord, which is not gradual. The "Scale," meaning the octochord in use, is highly artificial, of most complicated construction. Let us endeavour to follow up the process of formation, through all its maze of intricacy, making good each successive step as we advance.

The fifth, or its equivalent inversion, the fourth, has been already assumed as the basis of the cadential system. Let us now take two monochords, tuned by an ascending fourth as Dominant and Tonic. Placing one alongside the other, and marking the nodes of each, let us depict, by connecting lines, the cadential procession of overtones from the dominant to the tonic monochord.

The dominant string (marked Do on the diagram), is laid off on an eighteen inch scale: the tonic string, Fa, on a twelve inch scale

The lower half of each string (useless to the diagram as including no overtones) is assumed, there being no room on the page. It is partly indicated by dots.

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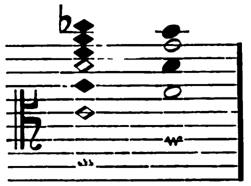
* The descending scale contains a monochordal cadence, from Do-sol to bemol.

By this method we obtain an angular measurement of the bichordal intervals.

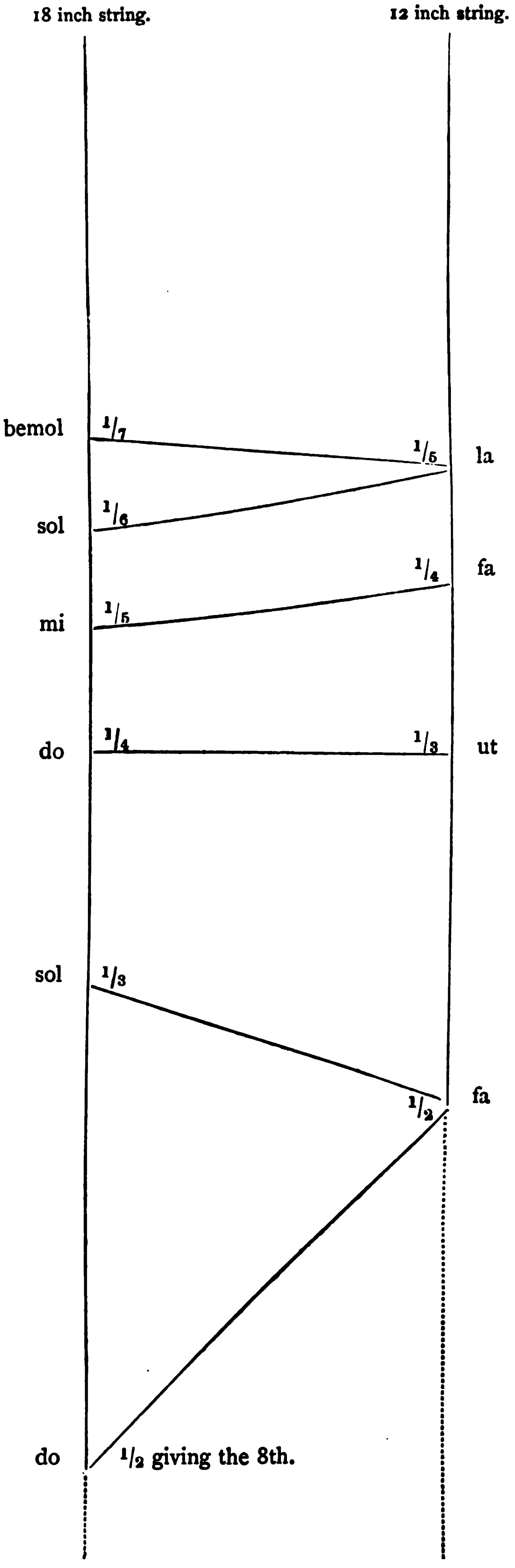
As the width of the space between the Do string and the Fa string affects the measurement (though not disturbing the proportions) of the angles, it will be convenient to make the line do-fa the diagonal to a square.

The linear representation is equivalent in musical notes to



Thus connecting the nodes of each string,—the Do nodes with the Fa nodes, we obtain all the bichordal cadences.

Observe, that by connecting $^{1}/_{6}$ with $^{1}/_{4}$, and $^{1}/_{6}$ with $^{1}/_{5}$, we obtain the tetrachord*



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* The coincidence, if it be really nothing more, is remarkable. From this tetrachord, not so very long since, were derived all the notes of the ascending scale,—namely, mi, fa, sol, la, fa, sol, la; a method which though now disused, has many advantages for theoretical purposes. For ut, and re are but intruders, and have been the cause of not a little mystification.

The tetrachordal notation is well explained by Christopher Sympson (1678).

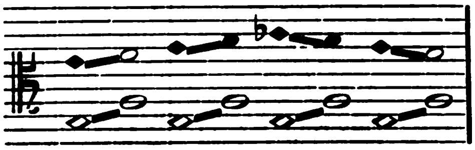
"Of Naming the Degrees of Sound."

"Before we come to the tuning of these degrees, you may observe, that a voice doth express a sound best, when it pronounceth some syllable with it. For this cause, as also for order and distinction's sake, six syllables were used in former times, viz., Ut, re, mi, fa, sol, la; which being joined with the seven letters, their scale was set down in this manner, as follows [Γ-ut, A-re, B-mi, &c.]. Four of these, to wit, Mi, Fa, Sol, La (taken in their significancy), are necessary assistants to the right tuning of the degrees of sound, as will presently appear. The other two, Ut and Re, are superfluous, and are set aside by most modern teachers."

"We will therefore make use only of Mi, Fa, Sol, La, and apply them to the seven letters, which stand for the degrees of sound. In order to which, *we must first find out where Mi is* mi, fa, sol, la; corresponding to the tetrachord of the Greeks, and supplying that old-fashioned notation of the scale, which, in England, supplanted the Hexachord of Guido.

The ascending tetrachord, mi, fa, sol, la, suffices to the formation of an ascending octochordal scale. But for the descending octochord, a descending tetrachord is required. The descending is constructed on the same pattern as the ascending tetrachord, being composed of a tonule, a false tone, and a tone.* As the one ascends from bequarre, so does the other descend from bemol.

By one and the same prime cadence four representative cadences, moving gradually, are supplied; two ascending, and two descending.



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*to be placed;* which, being known, the others are placed by consequence; for Mi hath always Fa Sol La above, and La Sol Fa under it, in such order and manner as you will see them set in the margin. I will therefore give you a rule for the placing of Mi, and the work is done."

la
sol
fa
mi
la
sol
fa

"A Rule for the placing of Mi."

The first most natural place for Mi is in B. But if you find in that line or space which belongs to B, such a little mark or letter as this [♭], which is called a ♭ flat, and excludes Mi wheresoever it comes, then is Mi to be placed in E, which is its second natural place. If E must have also a ♭ flat in it, then of necessity you must place Mi in A."

"I have seen songs with a ♭ standing in A, in B, and in E, all at once; by which means Mi hath been excluded from all its three places: but such songs are irregular, (as to that which we call the sol-fa-ing of a song), being designed for instruments rather than for voices: However, if any such song should be presented to you, place your Mi in D with fa sol la above, and la sol fa under it, as formerly delivered."

As for the ♭ we last mentioned, take notice, that when it is used at the beginning of a song, it causes all the notes standing in that line or space to be called Fa, throughout the whole song. In any other place, it serves only for the particular note before which it is placed."

*(Sympson's Compendium.)*

The tetrachordal notation gets rid of the προσλαμβανομένος arbitrarily introduced by the Greeks; and of the ὑποπροσλαμβανομένος commonly said to have been added by Guido, but mentioned by a late Greek writer, Aristides Quintilianus:—that is to say, of Re, and of Ut.

* The words are used advisedly. The more usual expression would be,—a tonule and two tones.

From these cadences is obtained

### THE PENTECHORD,[*]

the extreme notes of which,—bequarre and bemol, are the characteristic notes[†] of the scale. The pentechord is the master key to the science of music.[‡]

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[*] I introduce the term Pentechord, for the purpose of leaving to the Diapente its usual meaning. In its ordinary present acceptation, the Diapente signifies the first five notes of the standard octochord scale. To the Diapente, the Diatessaron is the supplement. But there would be no objection to designating the Pentechord as the "lesser diapente."

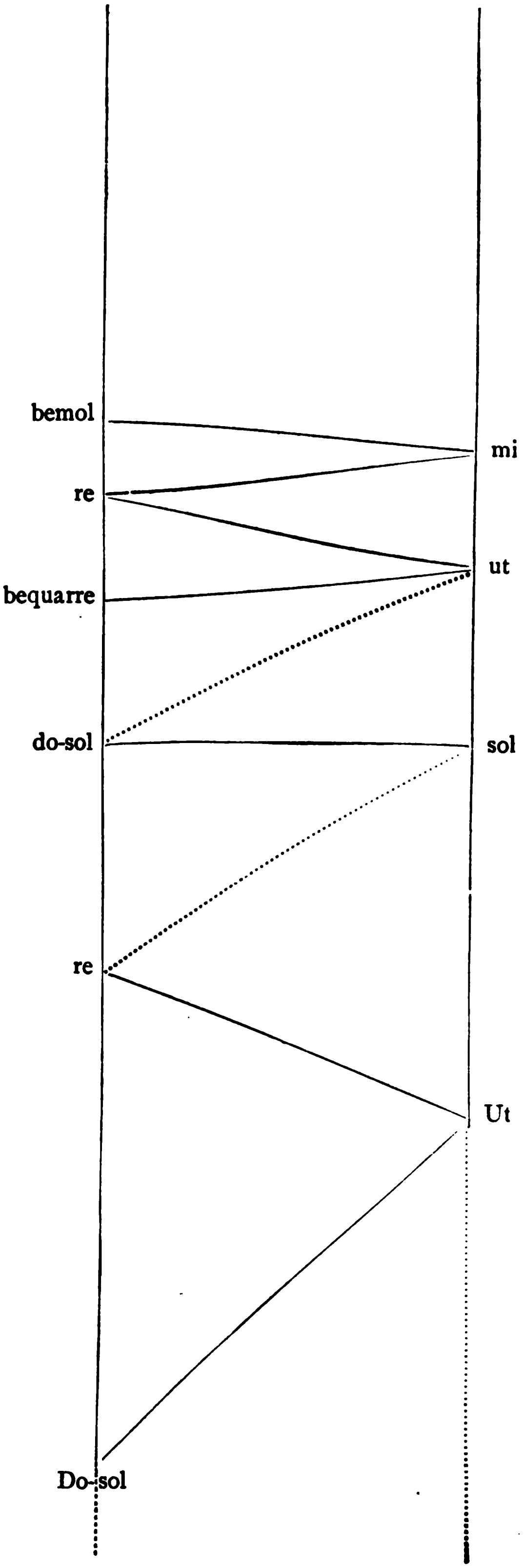
[†] The extreme notes of the Pentechord are the Gog and Magog of music. But, although brethren, they agree no better than did Cain and Abel of old. The two are, literally, in false-relationship; being, in technical language, "mi contra fa."

[‡] Being the cycle of scale notes, all of which it contains; for si, ut, re, mi, fa, are merely other names for mi, fa, sol, la, bemol, transposed. Borrowing a term from "the black art," it is a pentacle, within the limits of which alone safe theorising is to be found.

# CHAPTER IX.

## THE TRANSPOSED PENTECHORD.

Hitherto, our dominant note has been C; our tonic note, F.* By this choice of Primes we were conducted to a "naming of degrees" that was once in use, but is now obsolete. The examples will henceforward be given in the key of C. The cadences will therefore be named as in the altered diagram;—that is to say, in accordance with modern practice, but with three modifications, two of these being necessary, and one convenient. The Dominant will be termed Do-sol, or Do for shortness. The same note, when not prime, but only an overtone upon Ut, will be termed sol. The seventh of the ascending scale, an immutable note, will be termed, bequarre.† The same note in the descending scale, a mutable note, will be termed si, retaining its present name. The fourth of the descending scale will be termed bemol, to distinguish it from Fa‡ of the ascending scale.



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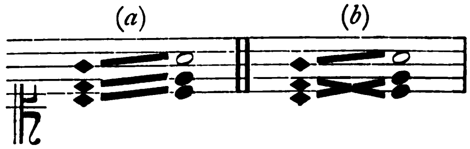
* The scale of F would have been preferable, for exemplification, to that of C; the true position of the flat seventh, bemol, and of mi being in F so clear to the eye. The names of *node-notes*, as they stood in the preceding diagram, might then have been preserved without alteration. But it is usual to work from the scale of C. I conform, to save trouble to readers, who have been taught to consider Ut as the first of the scale, re as the second, κ. τ. λ. Our modern appellation of the notes of the scale effectually disguises their nature and quality; but it is practically, though not theoretically, convenient. Moreover we are used to it. The English alphabet has its faults; but if a book were written in a reformed character, no one would read it.

† The seventh of the scale ascending is necessarily sharp. The seventh, so called, in the descending scale is no longer a real seventh, but the third of a new scale, capable of being minorized.

‡ The fourth of the scale is Fa, subdominant and prime, ascending; it is bemol, an overtone, flat seventh upon Do-sol, descending.

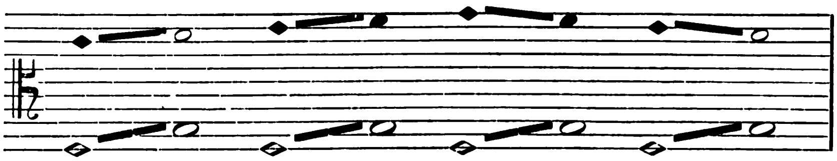
The dotted lines on the diagram shew that there are cadences, real though not gradual, from re to sol, and from do-sol to ut.

The diagram proves the correctness of the rule for resolution of the dominant chord,—namely, that, "the fifth of the scale goes to the first, or remains stationary; the second of the scale ascends or descends; the seventh of the scale ascends, and the fourth of the scale descends." It also rectifies a common error,—namely, that bemol may ascend bichordally,* by license, as in (*a*). For it shews how such license may be avoided, as in (*b*), without violating the Canon of the Cadence.†



The notation of the Pentechord may now be adapted to the altered diagram.

The four representative cadences are now, by transposition, bequarre—Ut: re—mi: bemol—mi; and re—Ut.



Observe, that there is no cadence from Ut to re, nor from mi to re; but that there is a cadence from re to Ut; also from re to mi.

Treating the scale as a succession of cadences, it follows that the 9 : 8 tone, commonly called major, belongs to the descending scale; the 10 : 9 tone, commonly called minor, to the ascending scale.‡

To draw a subtle distinction, it may be said that from Ut to re is a distance, but not an interval, in the technical sense of that term. For the two notes bear no relation to each other: they are ἄλογοι. By analogy with the so-called false fifth, Ut re, and mi re may be termed False Tones.

Let it now be borne in mind, that whatever complication may ensue—and it will increase in multiple ratio as we advance,—we shall never loose our hold on the original representative cadences of the Pentechord.

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* Monochordally, the ascent would be lawful. *Vide infra.*

† Of course, in quick music, this nicety of cadential resolution would be disregarded. But it is elsewhere shewn that bemol may ascend, *monochordally*, without license. For such ascent is not a resolution; but merely a change of position in the overtones of one and the same dominant chord. This is enough to shew that the distinction between the monochordal and bichordal cadence is not fantastic.

‡ The difference of extent, to be found by easy calculation, between the ascending and descending tonules,—bequarre Ut, and bemol mi, must be also noted.

# CHAPTER X.

## THE HEPTACHORD AND OCTOCHORD.

Having found the Pentechord, we shall now, by aid of modulation, deduce from it the Heptachord, in its normal and in its standard forms.* From the Heptachord, in turn, will be deduced the Octochordal scale,† also in its normal and in its standard forms.

The normal Heptachord is from bequarre to la.

The normal Octochordal scale is from mi to mi.

The standard Heptachord is from Do-sol to Fa, ascending ; and from bemol to Do-sol, descending.

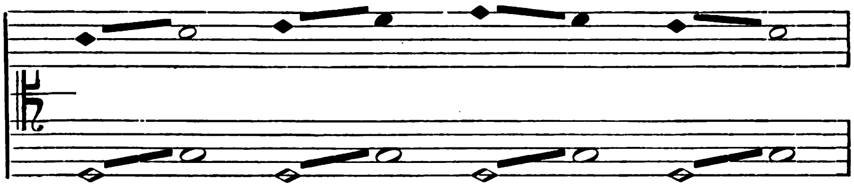
The standard Octochordal scale is from Ut to ut.

With a view to more orderly procedure, the several processes of construction shall be treated as Problems.

Problem i.

To construct the normal Heptachord.

Upon a prime cadence, establish a Pentechord.



For the ascending scale, take the ascending representative cadences.

It thus appears that two Cadences‡ make a Tetrachord.

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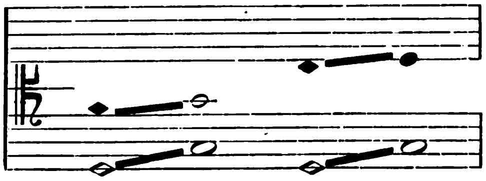
* "Normal," and "standard," are adopted as conveniently expressing the simple, or original form, and the form in modern use.

† The scale is commonly regarded as the most natural succession of notes,—a pattern of simplicity. By following up the process of construction, it will be shewn as highly artificial, complex, and more or less imperfect. The simplicity is only to the eye. Yet it is for the most part treated as if of cabbalistic force.

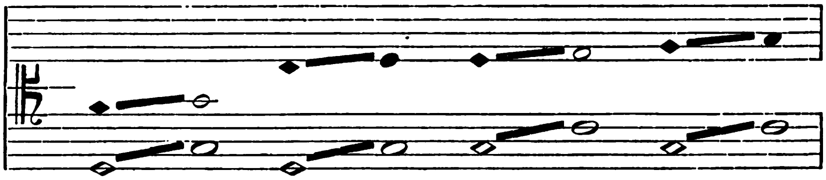
‡ Two representative cadences; the Prime Cadence remaining unchanged.



Farther ascent by way of cadence is not possible ; for bemol (f), seventh to Do-sol of necessity resolves downwards.

Therefore we must adopt a new prime cadence.

To the cadence G—C, add the cadence C—F.*

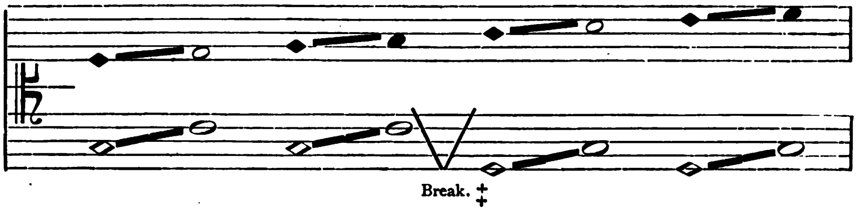


C—F will now be termed, the Upper Cadence.

It thus appears that two Tetrachords make a Heptachord.

### Problem ii.

To construct the normal Octochord. Transpose the Tetrachords of which the normal Heptachord is composed.†



This sequence corresponds to that of the Phrygian mode authentic.

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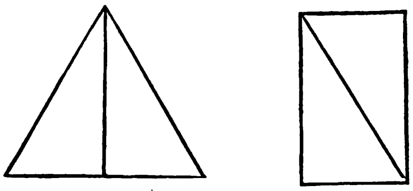
* F, prime, must be distinguished from overtone f, which is bemol. F, prime, called subdominant, is in reality the Upper Tonic.

† This transposition is the neatest and most simple manner of obtaining the diazeuctic tone,—of changing from the conjunct to the disjunct system. By a similar process the isosceles triangle is converted into a rectangle of equal area.



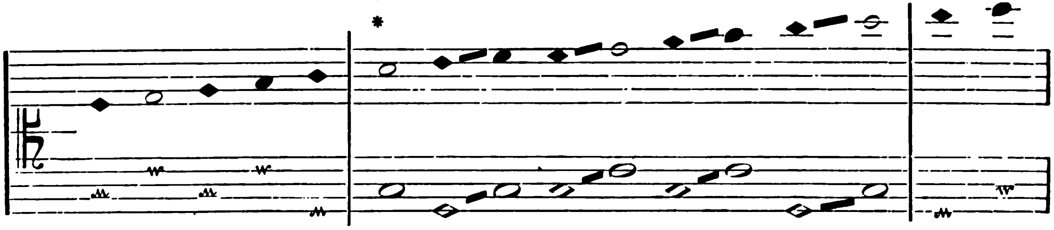
‡ "The Break" is the weak link in the scale ; *le défaut de la cuirasse.* It will presently lead us to consideration of the broken cadence, and of the artifice by which continuity of impression is obtained.

## Problem iii.

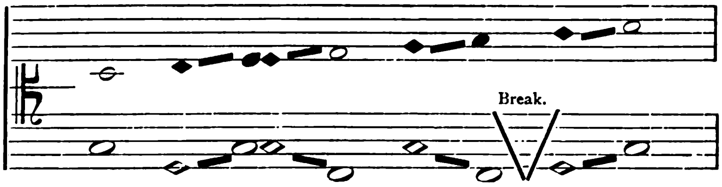
To construct the standard Octochord Scale. Two modes of construction may be employed,—the one by means of two cadences ; the other by means of three.

First form :—

Double the normal scale, by way of continuation, and cut out the required Octochord, Such octochord shall be termed, "a sectional scale."



The doubling of the two e's, mi and bequarre, cannot here be avoided, as in the normal scale, by transposition. Crasis must be resorted to; e coming in as tonic, and going out as dominant.† The ground-bass, while preserved, may be more conveniently arranged than in the preceding diagram.



Here is seen the anomaly of two primes in diatonic succession, each bearing a greater third.‡

## Problem iv.

To construct the standard Heptachord.

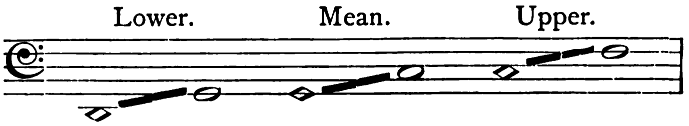
For the normal heptachord, two prime cadences only were required. That which we are now about to construct will be framed upon three; upon a lower, a mean, and an upper cadence.

---

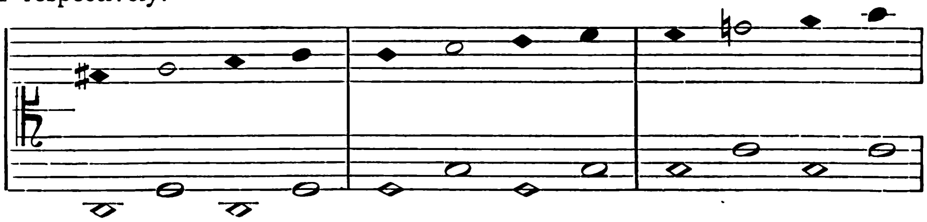
* The original cadences are preserved throughout. Looking to the first point of severance, it will be seen that there is no connexion between the first and second degrees of the ascending scale. It will presently be shewn that there is a real cadential connexion between the same two notes in the descending scale.

† Therefore, the third of the scale bears either $\begin{smallmatrix}6\\3\end{smallmatrix}$, or $\begin{smallmatrix}6\\5\\3\end{smallmatrix}$.

‡ Two primes in diatonic succession involve a modulation, more or less well concealed. And although they may be artificially connected, by the broken cadence, with the help of that piece of musical jugglery called the Great Sixth, there is still no true continuity.

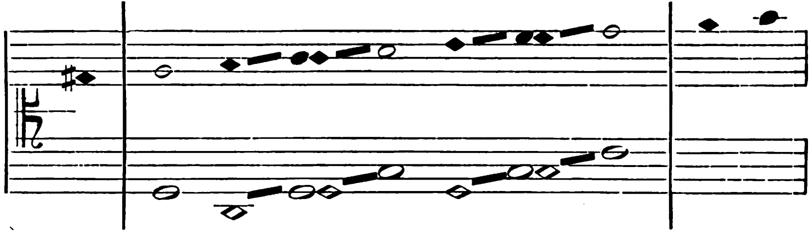


From these three cadences we obtain the three tetrachord scale,* in the keys of G, C, and F respectively.



We thus arrive, though by a process unrecorded among the Greeks, at the ἐπισυνάφη, or conjunction upon conjunction of Ion.

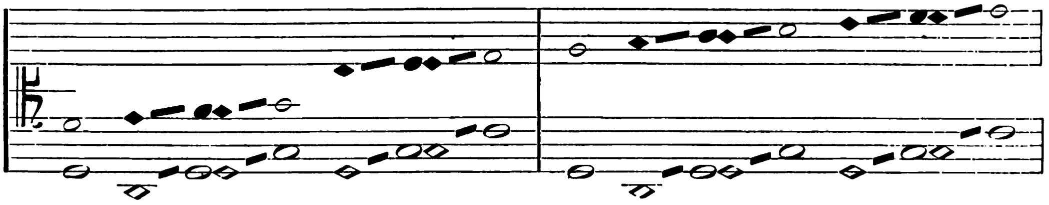
Cutting off ♯f † from the beginning of the three tetrachord scale ; cutting off g, a, from the end, and joining the repeated notes by crasis, the standard Heptachord remains.‡



Problem v.

To construct the standard Octochord Scale. Second form.

Doubling the standard heptachord, and cutting out the sectional scale from C to C, we obtain the triple cadence Octochord.



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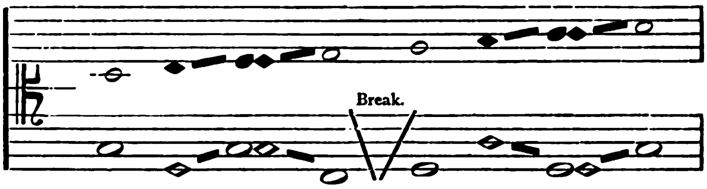
* This is the Decachord ; a natural scale, of perfect melody, being unembarrassed with the harsh Tritonus.

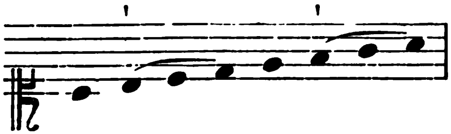
† This ♯f affords the first intimation of the equivocal nature of the fourth of the scale. In the three tetrachord scale, f ascending is first bequarre, and then upper tonic. It will presently be termed, the "equivocal note." But this is in anticipation.

‡ It should be noted that both the standard and the normal Heptachords are major, notwithstanding the absence of a sharp seventh. This becomes evident when it is observed that the Key-note is within the scale, led up to by the sharp third. Confusion has arisen from the unfortunate misnaming of f, as a "minor" seventh on G. The proper term is, flat seventh.

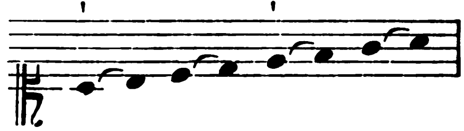
The section effected, there remains,—



The true cadential accentuation of the scale is thus displayed :—[*]



rather than



The essential differences of the two forms of the standard octochord must be noted.

1st form :—the break is between the sixth and the seventh of the scale.

2nd form :—the break is between the fourth and fifth of the scale.

1st form :—the fifth is an overtone, and therefore accompanied by 6 .

2nd form :—the fifth is prime, and therefore accompanied by 5 .[†]

1st form :—the sixth (la) is derived from Fa, and is therefore represented, numerically, by the fraction $^5/_3$ .

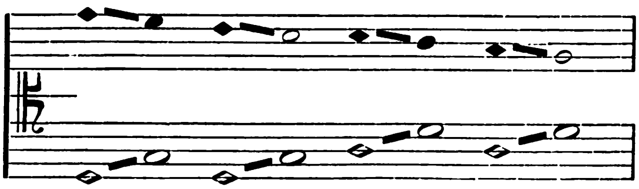
2nd form :—la is derived from Re, and therefore represented by $^{27}/_{16}$ :

The two la's being to each other as 80 : 81

### Problem vi.

To construct the Normal Scale, descending

Proceed as with the normal scale ascending, using the descending cadences of the Pentechord ; thus obtaining a descending Heptachord, the highest note of which is bemol ; not Fa.



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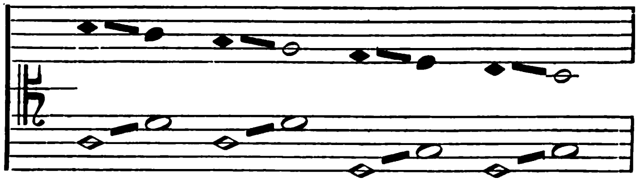
[*] I may be wrong, but it seems to me that the character of instrumental music, as regards composition, has been affected by the habit of gamut playing with the accent on the key-note. Vocal music has resisted ; the voice having a propensity towards cadences which refuses to be overcome.

[†] In the old books it is matter of dispute whether the fifth of the scale should bear $\substack{6\\4}$, or $\substack{5\\3}$.

[‡] The difficulty of playing "a simple gamut" in tune is notorious. Tartini is reported to have said that the very thought of a slow gamut made him tremble. But the difficulty is confined to playing the scale without the supporting bass. The cause now becomes evident :—namely, that more than one ground bass can be applied to a scale, giving overtones that differ by a komma. The ear, in the absence of the bass, remains uncertain which overtone to choose.

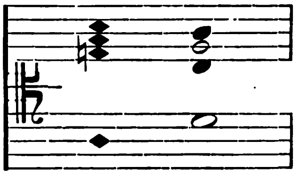
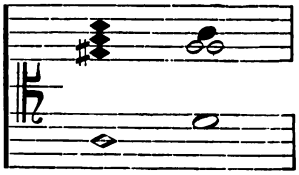
To get rid of the repeated note, invert the tetrachords.

*

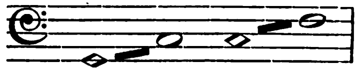
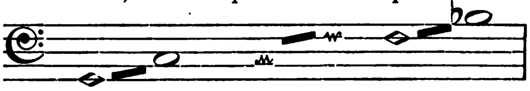


This scale is also the standard scale; obtained more easily than the standard ascending scale, because of our having an additional overtone, ∝7, at disposal.

The modulation from C into G, artfully disguised in the ascending scale, is of necessity avowed in the descending scale. Prime D, bass to the first degree, being dominant to G, in strictness bears the sharp third. But the abruptness of the modulation may be softened, in practice,† by substituting for the chord of the seventh on the dominant, that of the seventh on the second, playing

 instead of 

Thus the impression of the key of C may be preserved for two notes longer; but avowal of modulation is compelled when we reach the sixth of the scale.

It may here be observed that, in strictness of speech, modulation takes place when a prime cadence passes to the next prime cadence in succession: *ex. gr.*,  but, in the ordinary acceptation of the word, when a prime cadence passes to the next but one (or more) in succession: *ex. gr.*, 

By the arbitrary substitution of C, for D, bass to the first degree of the descending scale, we obtain the bass in ordinary use. This C, however, is not a ground-bass, but a contrapuntal bass. I believe it to be illegitimate, but many a good knight has borne the bend sinister on his shield.

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* This treatment of the first degree of the descending scale may be deemed a startling innovation. Were it not that we are used to the mutilation of the tetrad,—*i.e.*, to ignoring the seventh on the dominant excepting as a "note of addition," or by way of suspension, it would scarcely be so considered. I cannot see how the undisguised modulation which is forced upon us in the descending scale, is otherwise to be systematically accounted for.

It must be observed that prime D, being dominant, bears ♯f. If treated with ♮f, d becomes an overtone,—a fifth on dominant G. The c will then become an eleventh on the dominant. See Chapter xiii on dissonant overtones.

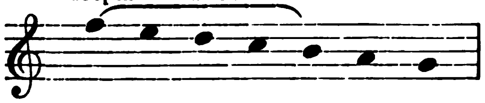
† Further explanation will be made when we come to treat more fully of the monochordal cadence.

Attention is invited to the essential difference between the heptachordal and the octochordal scales. For both are in actual use, though the former is commonly ignored. In the heptachordal scale, μέση, the key-note,* takes its natural place in the middle. In the octochordal scale, the key-note is relegated to the extremes.

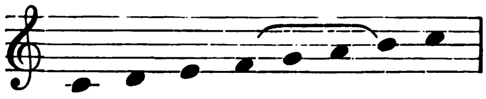
The result of this is, the introduction of a glaring mi contra fa, in the sharp fourth,—the harshest of intervals, from f to ♮b ascending; while the flat fifth, treated melodially, and by descent, is among the most euphonious.

By way of example, and to shew that the octochord ascending is characterized by the Tritonus, as the heptachord descending by the Flat Fifth, let us write a melody in the heptachordal scale, and then transpose it into the octochordal.

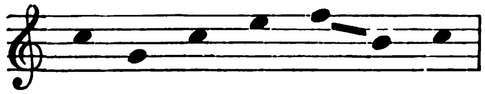
Heptachordal Scale.



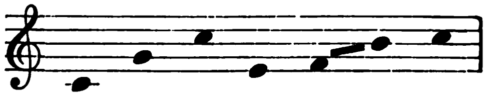
Octochordal Scale.



Heptachordal Melody.



Octochordal Melody.



From this, it is evident that the sharp fourth is the flat fifth, turned the seamy side outwards,—*le revers de la tapisserie.*

The Heptachord, with the key-note in the middle, is not defective in construction. But it cramps, by turning back the phrase, when reaching the highest note. For it contains, and is governed by the flat fifth, which resolves inwardly; and by which, in hunting parlance, we find ourselves "pounded." But the octochord is governed by the sharp fourth,† which resolving outwards, enfranchises the musical phrase, letting it out of bounds. By passing from a to ♮b, instead of from a to ♭b, we overleap, no matter how uncouthly, the barrier that confines us within the limits of the heptachordal scale. Not, however, without a shake in the saddle.

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* Μέση, of the conjunct system, is certainly entitled to the rank of key-note, all the other notes being tuned to it. But apparently some distinction has to be taken (in so far) between key-note and tonic. Referring back to the construction of the tetrachord, Page 29, it will be seen that a tonic can be approached from below only by a half-tone. But μέση approached by a whole tone, seems rather to correspond to mi the third of the modern scale; at least if its place in the tetrachord be considered.

The tonality of the disjunct system is even still more vague; though in form, that scale may seem, at first sight, more closely approximate to our own. I much regret having to do violence to my own antiquarian predilections so far as being obliged to denounce the disjunct scale of the Greeks, with προσλαμβανόμενος subterposed, and παραμέση wedged in above μέση, dislodging the superior notes, and pushing them one grade higher, as a lumbering piece of patchwork.

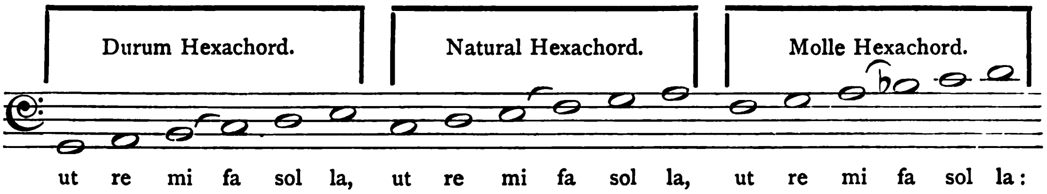
† In considering the æsthetic effect of harmonious progressions, attention should be concentrated on the opposite qualities of the Pentechord and of the Tritonus. The two may be held to signify the dualism of music. The one is contractile, drawing inwards; the other expansive, throwing outwards, emancipating the scale.

By a not very far-fetched analogy, they may be termed the positive and negative poles of music.

There is a strong natural attraction between mi and fa, when face to face, which becomes repulsion when they are placed back to back. They are at once fawners and back-biters. From this it comes that the ecclesiastical tone called Lydian, harsh as a scale, is soft, even to effeminacy, when rightly handled.

We have thus, by sure though many steps, reached the modern Octochordal scale, (called by some the first of the two Neapolitan modes), corresponding, at least as to incidence of grades, with the "modus lascivus" of our forefathers. It is secular in character, differing essentially in treatment from the ecclesiastical tones.*

Let us finally observe that a notable cause of the confusion that has prevailed, has been the adoption of Guido's Hexachord, the effect of which has been to obscure the only true doctrine,—that of the Pentechord.



mi being always the first note of the tetrachord, while re and ut are arbitrarily subterposed, to the utter abrogation of systematic construction.

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* It is not easy to draw a line of demarcation between what is loosely called "sacred music" and "secular." Solemnity does not make the difference; for there is plenty of that on the operatic stage. But between Church-service music and secular music the difference is plain enough. Church music was, and ought to be still, restricted to the Church modes; preferably, to the first eight of those modes.

The difficulty, in regard to modern composition, is this:—that although we are still able to *translate* into those modes, we are no longer able to *think* in them. The modern octochord, partly through its own intrinsic merits, and partly through habit ingrained from childhood, has got possession of our creative power, and keeps it. There are clever men enough who can imitate, more or less exactly; but still the imitation, because nothing more, loses in value as much as does the copy of a picture, even if made by the painter of the original himself.

Now modern hymn-tunes—which must not be confused with chorales treated by polyphonic rule, being written and harmonized in the Neapolitan modes, *i.e.*, in the ordinary major and minor, are essentially secular. They are "part-songs;" not anthems. There may be some who think them none the worse for that; but it is well that congregations should know what these well-intended lyrics really are.

# CHAPTER XI.

## THE MINOR MODE.

The minor mode has no existence in nature, which acknowledges the major only.* It is a vamped-up piece of work,—unreal; consequently, all the difficulties which have been raised on the assumption of its reality, disappear.

D'Alembert's own mention of an irregularity that seems to conflict with the system of Rameau having been quoted in the preface to this Work, need not be repeated here. It will be seen, on reference, that he admits his inability to understand how a bass, which he *assumes* as a prime, should bear a minor fifth ;† seeing that no such interval (reckoning from the root) is supplied by the monochord.

Misled by a seeming analogy, he did not perceive that the minor mode has no ground-bass at all. The *scale* is assumed; and then, a contrapuntal bass is applied to it. The bass is derived from the scale; not the scale from the bass.

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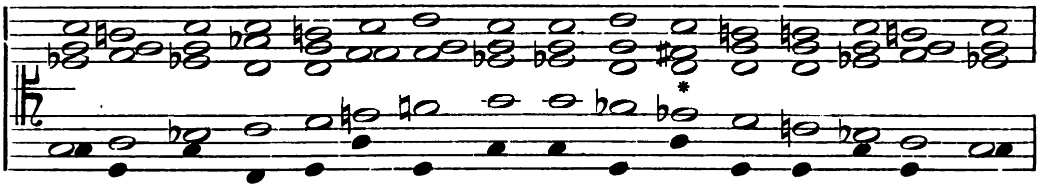
* The minor mode is artificial; it is to the major as torchlight is to daylight. Bacon's essay "On Truth" supplies the illustration :—

"One of the later schools of the Grecians examineth the matter, and is at a loss to think what should be in it, that men should love lies, when neither they make for pleasure, as with poets; nor for advantage, as with the merchant; but for the lie's sake. But I cannot tell: *this same truth is a naked and open daylight, that doth not shew the masques, and mummeries, and triumphs of the world half so stately and daintily as candlelight.* Truth may perhaps come to the price of a pearl, that sheweth best by day; but it will not rise to the price of a diamond or carbuncle, that sheweth best in varied lights."

Undoubtedly, the grandest effect in music is the sudden transition from the minor into the major mode of the *same* key. The feeling induced is that of relief. Its effect may be compared to that of a beam of light bursting through a cloud.

† He assumes, for the minor scale descending, the same ground-bass as for the major descending; thus causing the second of the scale to appear as prime to the sixth of the scale; *i.e.*, in the key of C minor, D as prime to ♭ a. But this interval is a minor fifth; which is not an overtone to D.

The canon of the minor scale, with the bass assumed by D'Alembert, is as follows:—



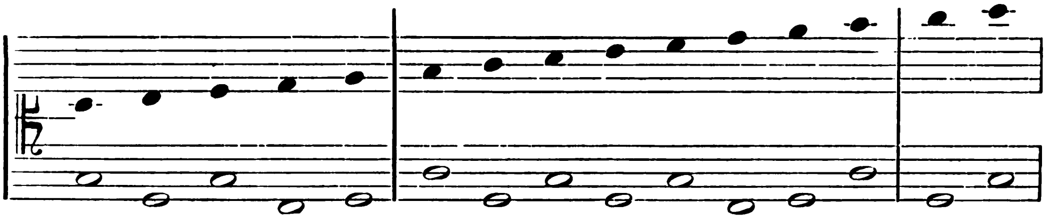
And this is the bass in common use, corresponding to the fundamental bass of the major mode.

Yet it is evident that Ut, if prime, cannot generate a minor third, or Re a minor fifth.

Therefore there is no alternative but to treat this bass as merely contrapuntal, assuming the minorized notes above by postulate.

That it is not fundamental may be otherwise demonstrated.

Cut out from the double octochord a sectional scale,—the scale of A, retaining the original prime bass, as manifested in the Pentechordal cadences:—



Thus is indicated the real ground-bass to the scale of A minor. But this is not the bass in use, nor, indeed, does it seem capable of being turned to practical account.†

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* There is a certain uncouthness about this chord, if re, the ground-bass, be played. But it is legitimate, as is shewn by the recognition of its second inversion, commonly called the French sixth.

† What is here said concerning the minor mode applies likewise to all the Church modes, save one. Our own minor mode is one of these; and through its superior melodiousness, also through a deviation from the ancient manner of treatment, has not become obsolete. Strictly speaking, however, harmony is only subsidiary to the Church modes,—an adjunct, forced upon them. For they are not throughout cadential. They were constructed for unison. Harmony is of modern invention, seemingly from the North, and not from the East. This is not the place to enter into the vexed question, whether harmony was known to the ancient Greeks; but even if it were, it was at all events lost again, and recovered by slow degrees, and by original invention. The birth of modern harmony is thus described by Choron, in his Summary of the History of music:—

"We just now observed, that the organ was introduced into France in the year 757, and soon became universal in the Churches of the West. This accompaniment was at first entirely in unison; but the facility with which several sounds could be distinguished at once, occasioned the remark, that, among the

If an excuse be sought for the unsatisfactory construction of the minor scale, we must be content with this. The ear has been used to a certain progression of bass primes under the octochord of Ut major. By association of ideas, it is led to tolerate the substitution of a similar progression under the octochord of la. For la, though in reality the sixth of the scale, *simulates* Ut, professing to be tonic,—the first of a scale; and is supported in this assumption by a fictitious bass.

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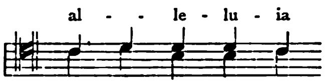
various union of sounds, many were agreeable to the ear. The minor third [say rather the little third] was one of the first remarked for its pleasing harmony, and was therefore generally used, though only at the close of an air, as we shall perceive from the following example. And this method was called *organising*."



The following remarks, though not specially directed to the harmonizing of the minor mode, are pertinent, giving indirect support to portions of the scheme I have ventured to advance. They are extracted from a paper on Church music, by Sir Frederick Gore Ouseley.

"If we study the music of those nations of the present day who have changed their manners and customs the least, we shall find in almost every case, that not only are they devoid of all acquaintance with harmony, but that harmonized music is absolutely painful to their ears. This is undoubtedly true in the case of the Oriental Jews, the Arabs, the Hindoos, and the Chinese. Moreover the Hindoo division of the Scale into quarter notes, and that of the Arabian Scale into thirds of notes, renders all idea of harmony, such as we understand by the term, absolutely impossible. . . . . In Persia, the division is the same as in Arabia and Egypt—viz., into thirds of tones. . . . .

The melodies of the Greeks were probably for the most part, simple, and only rhythmical as far as they followed the prosody of the words to which they were set. . . . .

St Ambrose and St Gregory . . . . chose the best melodies they could find, whether of Heathen or of Jewish origin, and digested them carefully into one homogeneous collection. . . . . Of the secular music of that date, we know absolutely nothing. . . . . But of both alike, we may safely assert one negative fact; they were not accompanied by harmony of any kind, nor were they easily susceptible of such accompaniment. The earliest specimens of harmony, and of a melodic scale susceptible of harmonic accompaniment, must be sought among the northern nations of Europe. This music has not the slightest analogy with the Gregorian or Ambrosian systems, nor yet with the music of the Greeks, or of the Oriental nations. The Vandals, from whom the Polish race is descended; the Goths, ancestors of the Swedes; the Scandinavians, now represented by the Danes; the Scythians, from whom spring the Russians, Cossacks, and Tartars, have left traces behind them of a peculiar and harmonized species of music, the antiquities of which have not received the attention they deserve. Of these nations the Scythians are the most ancient, and claim prior notice. If we examine the traditional melodies of the Russian peasant, we cannot fail to observe, first, the remarkable form of their musical scale, and, secondly, the regularity of their cadence. Their scale is that which we call minor, only extending, upwards to the minor seventh, or downwards to the leading note, added below the key-note. Thus, supposing the key to be a minor, the ascending scale will be g sharp, a, b, c, d, e, f, g natural. Such a scale as this is so suggestive of modern harmony, that if we find the melodies in it closing regularly upon a, or c, we are forced to conclude them to have been originally composed in a harmonized form. And it appears on investigation that they do invariably end, either on a, or c,—generally the former; and their leading notes, g sharp or b, are invariably followed by their tonic resolution. But besides this, we meet with other ancient instruments, with which in remote districts we find these curious melodies are accompanied in rough but tolerably correct harmony; and it is the opinion of many travellers who have studied the habits of these peasants that they have, with true conservative tenacity, handed down unaltered the music which existed in that country from the most remote antiquity. This altogether seems to justify the opinion that harmony was known among the Scythians, perhaps before the Christian era. Nor are similar indications wanting in the case of the ancient Celtic inhabitants of our own country."

The subject is one that has much occupied my attention, but I like when I can to fortify my position with another man's words, more especially when of such high authority; and have therefore introduced

In playing from an unreal ground-bass, the minor third or minor fifth may take the place of the corresponding majors,—may be forced upon the bass, because the ratios of vibrations happen to be such that the ear will bear them.

The search for a more philosophical conclusion will end, probably,* only in bewilderment.

---

it by means of a quotation. But the question of the variation of intervals, demanded by the musical ear of different races, is very curious, and needs careful investigation.

In the first place, the fact seems to be incontrovertible, that what is in tune to an Asiatic ear, is not necessarily in tune to an European ear. For instance :—I have often tried to set down the notes of a Maori song, but have never succeeded. I could not hear the intervals; I could get thereabouts, but not exactly there. Should any one claim to succeed, I could only come to the conclusion that his ear was not so delicate to small differences as my own. I had once a theory on the subject, based upon a change supposed to take place, with age, in the otolithes of the ear. But as Dr. Carpenter, to whom it was mentioned, set his foot upon it, it cannot be worth repeating. He did, however suggest, though only as what lawyers call "a travelling opinion," that the difference of hearing might be one of the numerous phenomena of heredity. The question is one of much interest, and is bequeathed, for investigation, to successors more capable than myself.

* It is possible that a minor third on the tonic may be given by nature : I only maintain that it is abnormal in any system based on the aliquot parts of a string.

"On est assez généralement d'accord de frapper l'accord parfait mineur en invertant l'ordre des tierces comprises entre le son fondamental O et sa quinte 7. 0195500 [log.] ; et Monsieur le Baron Blein dit avoir reconnu que cet ordre de tierce est donné par les harmoniques d'un cylindre suspendu dans le sens de son axe."

*Instruction Élémentaire. Sur les moyens de calculer les intervalles musicaux.*

M. le Baron de Rony. p. 20.

# CHAPTER XII.

## ANALYSIS OF THE MINOR SCALE.

So far as regards the usual treatment of the minor scale, we have been compelled to proceed by confession and avoidance. There is no outcome, unless by declaring it conventional. But the usual mode is not the only mode of treatment. It is therefore worth while to shew, exactly, how far the minor mode is capable of subjection to the cadential system, though rather as a matter of curiosity than of practical use.

Granted the minor third upon a prime,[*]—the main disturbing element in the question,—the deduction from the never failing cadences of the pentechord may be still pursued, without dropping a link in the chain.

For the sake of contrast, we shall operate, not upon what is called the "relative minor," A; but upon the tonic minor, C. Thus will the essential differences between the major and minor modes be more clearly presented to the eye.

### Problem vii.

*To construct the Minor Scale.*

The minor mode is formed, conventionally, by substitution of a minor[†] for a major third on each tonic bass note of the scale. This simple formula fulfils every condition; even settling a long disputed question,—the nature of the sixth of the minor scale ascending.

---

[*] By postulate; and by a postulate of great exaction.

[†] What is a minor third? what is its ratio? by what fraction is it numerically expressed?

It is the third on a tonic note, lowered by half a tone (so called), and nothing else; although like Henry IV. at Shrewsbury, it "hath many marching in its coats." The ratio of the minor third, Ut—♭mi, is said to be the same as that of the little third, mi—sol; consequently both are alike expressed by the fraction $^6/_5$.

But why should the ratio of the minor third necessarily be that of the little third, rather than of the flat third, re—fa, expressed by $^{21}/_{18}$; or of the third from re to Fa subdominant, expressed by $^{32}/_{27}$? How do we satisfy ourselves that it does not differ from all three? I believe the assumption of $^6/_5$ to be correct, but ask for proof.

There is reason to think that the minor third is not only co-extensive with the little third, but is absolutely identical with it. The *tierson*, or difference tone to C—♭e, is ♭a, two octaves and a major third below. Therefore I suppose C—♭e to be the little third in the triad of ♭A major.

The defect in absolute proof is evident: it is from $^6/_5$, (the numerical expression for the little third) that the difference tone is obtained.

There is another difficulty to be got over. If C—♭e, commonly called a tonic third in the key of C

Thirds upon tonic primes will henceforth be called "mutable notes," being either major or minor.*

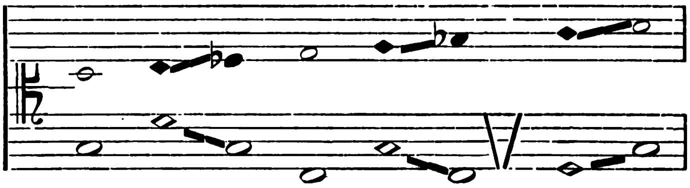
It must however, be borne in mind that, although the major third upon a tonic bass may be minorized,—*i.e.*, lowered by half a tone, the *sharp* third, upon a dominant, must of necessity remain unaltered. It is immutable; for the dominant, without a leading third, expressed or implied, is no longer dominant.

Referring to the normal octochord, as set out in problems iii. and vi., it will be seen that tonic primes are the first and fourth ascending; the fifth and first descending.

As there are two manners of constructing the standard major scale, so are there two manners of constructing the minor.

*First manner.*

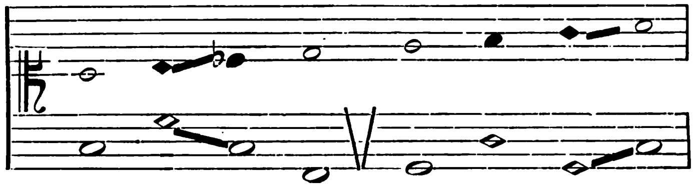
Assume the ground-bass of the standard scale ascending, as in problem iii.; substituting a minor for a major third on the tonic, and on the upper tonic; *i.e.*, on Ut, and on Fa.



Observe that b, having a dominant prime, is necessarily sharp; but that a is minor, being a third upon a tonic prime.

*Second manner.*

Assume the ground-bass as in problem vi.



In this form, a, being fifth upon prime D, is necessarily natural.

---

minor, be really the little third in the triad of ♭A, what becomes of the ♭d, which does belong to the key of ♭A major, but has no place in the key of C minor? Two answers can be given. The first, is that the fourth is held by many to be an interloper only into the scale; the old-fashioned gamuts possessing neither fourth nor sharp seventh. This, however, is not in full accordance with the system here propounded. A more sufficient answer is this,—that the fourth of the scale, as shall presently be shewn, is an equivocal note; either flat or sharp, according to the use that is made of it. *Vide infra.*

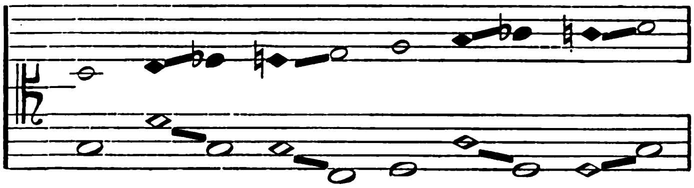
* In figuring, the minor third will henceforth be distinguished by a dot following the numeral—3• the major third by a dot preceding— •3 .

It thus appears, that the dispute whether the sixth of the ascending minor scale should be flat, or natural, is as profitless as that whether the fifth of the scale should bear the fifth or the sixth. Both manners are right, the variation following the variation of the ground-bass.

Upon comparison of the ground-bass to the major scale (problem v.), it will be seen that the minor scale is less cadential than the major. In problem v., Ut, bearing the third of the scale, comes in as tonic, and goes out as dominant. Consequently it bears two mi's: the first major; the second sharp. These being synonymous, were taken together in the major scale by crasis. But where, as above, the first is minor, and the second sharp, they are no longer synonymous, and cannot be so fused. Therefore, we must either leave both in the scale, or omit the sharp mi by postulate. But every new postulate implies an imperfection; in this instance, the loss of a cadence, from Ut dominant, to Fa tonic.

The same imperfection must be noted in regard to Do-sol, bearing the seventh of the scale.

Consequently, the unpruned minor scale would stand thus:

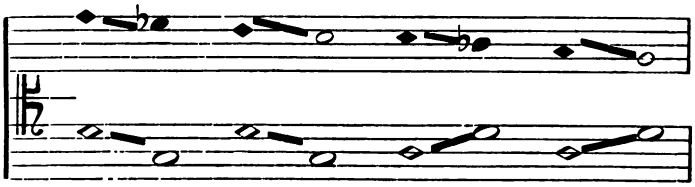


A scale certainly more euphonious than that in use, because more perfectly cadential.

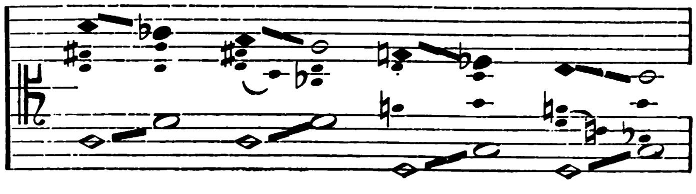
This mention may seem trifling and over-nice; but the object is, to leave not a single link of the chain untested.

### Problem viii.

The minor scale, descending, is formed from the descending cadences of the Pentechord, treated as in problem vi., but minorizing tonic thirds.



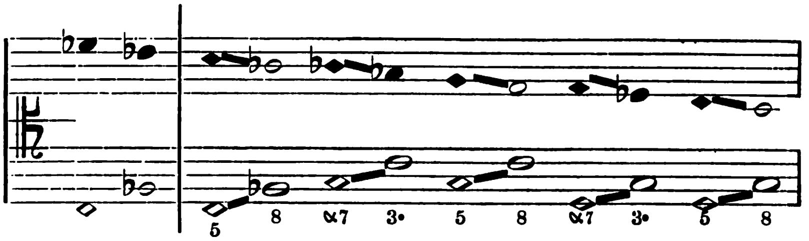
Inverting the tetrachords, to get rid of the repeated note; adding also the full harmony we obtain:—



In accordance with the rule, the sixth of the scale is natural; not minorized. Under this mode of construction, the two tetrachords are correspondent.

But the scale in actual use demands ♭la. This is the *crux*,—the unsolved problem of D'Alembert. How is the descending sixth to be minorized, without abandoning our rule of procedure?

It is evident that ♭b and ♭a cannot both be minor thirds on tonic primes; for that would imply two tonic primes in gradual succession. There is seemingly but one way out of the difficulty: to treat the ♭b as a flat seventh, and ♭a as a minor third. To attain this end, a three tetrachord scale must be resorted to, as for the ascending heptachord in problem iv.,



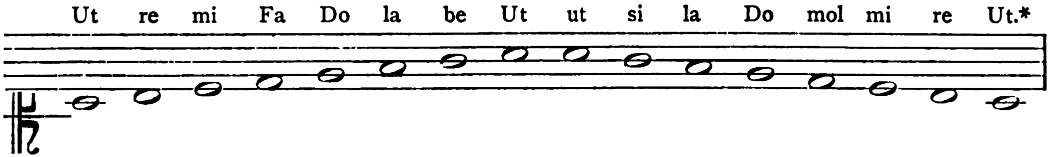
Join the doubled notes by crasis, as before, and the descending minor scale in common use remains.

By degrees, with some trouble, the minor scale has been subjected to the pentechordal rule:

*Rustica paullatim taurus aratra subit.*

But many will consider the original conclusion, that it is abnormal, as the best.

The scales, major and minor, having been thus formed, the names of the degrees will stand as follows:



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* Do, is short for Do-sol, *i.e.*, dominant sol: be, for bequarre: mol, for bemol.

Ut is always the key-note, and therefore movable. The syllabic notes are called, "scale notes;" by contrast with the literals, c, d, e, &c., which being of invariable pitch, are called "stave notes."

The fifth of the scale may be either Do-sol, prime; or sol, harmonic fifth to Ut; the prime bearing 5; the overtone 6.

Be it observed that this notation of the scale is used, only because sanctioned (saving three necessary alterations) by custom. In theorizing, we must be careful never to lose sight of its imperfection. *Ex. gr.:* the seventh, sixth, and fifth of the descending major scale are in reality, mi, re, Ut. In the minor, the seventh, descending, is bemol.

# CHAPTER XIII.

## THE DISSONANT OVERTONES.

Three overtones, reckoned as the ninth, the eleventh, and the thirteenth on the dominant, yet remain for consideration. They find no place in the scale, but are employed in the construction of certain chords. Generally, they shall be termed chord-notes: severally, Dominant la, dominant ut, and dominant mi; or, for shortness, do-la, do-ut, and do-mi.*

The chord-notes are dissonances; connected, however, with the consonances by the flat seventh, which partakes of either character. For, in music, nothing proceeds *per saltum.*

Of these the two highest, do-mi and do-ut, are monochordally cadential. The third, do-la is both monochordally and bichordally cadential; thus bridging the gap between the two species of cadence even as the flat seventh, in turn, connects consonances and dissonances.

do-la and do-mi are mutable, being, in all appearance, major or minor. do-ut is fixed.

The chord-notes differ from the scale-notes which correspond to them on the clavier, each by a komma.†

These notes are real,—in actual use; not attained merely by calculation.

There are no other dissonances.

Chord-notes will be distinguished, in figuring, when in close harmony, by ${}_{o}$, prefixed to the numeral: *ex. gr.*, ${}_{o}4$, ${}_{o}6$, the eleventh and the thirteenth on the dominant.

Their resolution is monochordal; for as will be seen by reference to the diagram of the double monochord, there are no notes belonging to the tonic or truncated monochord upon which they can fall.

Yet it will be found, on a closer examination, that the ninth is of a mezzo-carattere. For although, by Postulate, no new notes can be added to the triad, replicates are admissible.

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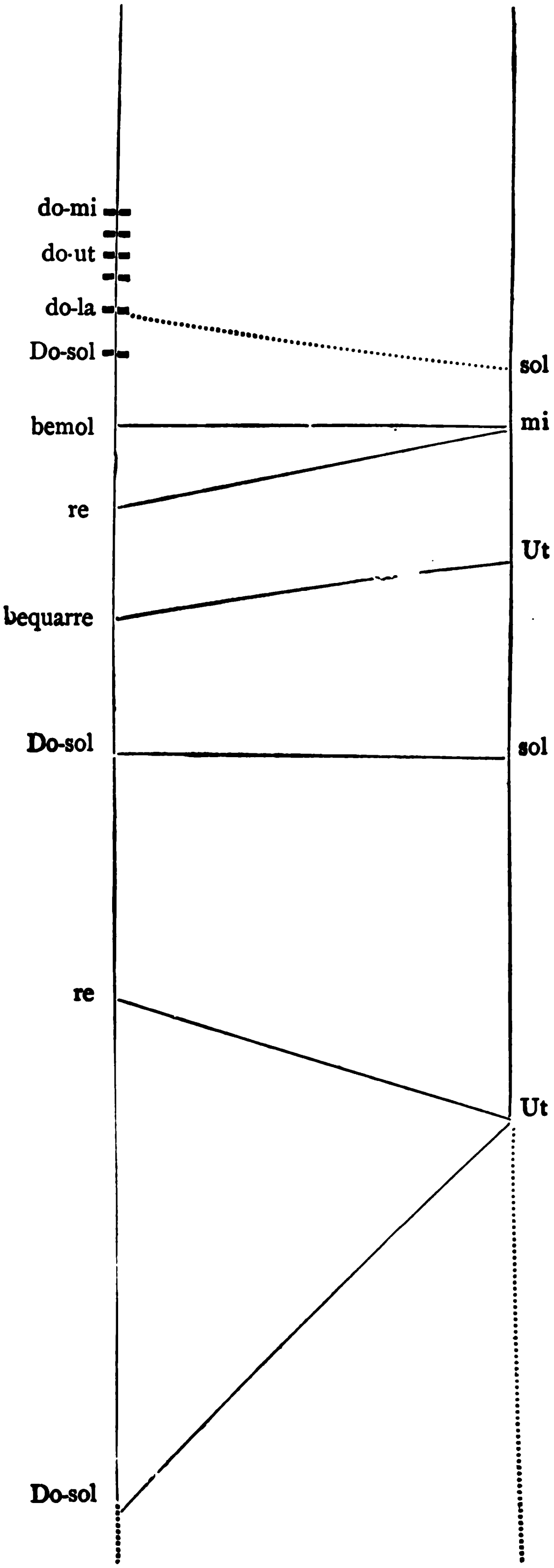
* The exigencies of modern music call imperatively for these additional notes; and the question is, how to obtain them without arbitrary assumption.

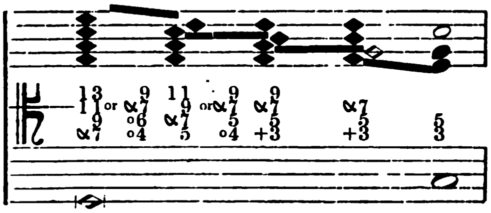
† By postulate it is assumed that notes differing only by a komma, are equivalent.

By adding a replicate of sol, as in the extended diagram, above the mi, the connexion between the two monochords is re-established.

It thus appears, that do-la, the ninth, may resolve monochordally upon Do-sol, prime and dominant; or bichordally on sol, overtone to Ut.



The monochordal resolution of the upper dissonances is as follows. The half cadences are contrasted with the concluding full, or bichordal cadence.



The minorizing of the ninth and of the thirteenth is established, in practice; but is not easily subjected to rule. Apparently, it is because these chord-notes correspond to the sixth and the third of the scale,—mutable notes. With regard to the minor ninth, a reason somewhat more satisfactory may be alleged,—namely, that it is a natural note; ♭la being a seventeenth below Ut; akin, though not in the same degree, as mi, the seventeenth above. To this we shall presently return, in fuller explanation.

# CHAPTER XIV.

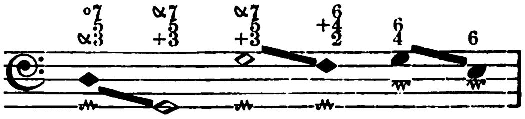
## DERIVATIVE CADENCES.

Hitherto the cadence has been considered only under its two grand divisions,—the monochordal, or half cadence;* and the bichordal, or full cadence. But from the bichordal cadence, subordinate forms arise.

To bring the whole category of cadences under one view, let us begin by reverting to the original types.

i. The Monochordal Cadence has been already described as the passage, or fall, from an overtone to its prime. It is also the passage from one overtone to another, both representing that prime.

The following are examples of the half cadence:—



The monochordal cadence has but one prime.

ii. The Bichordal Cadence passes from one prime to another prime.

It appears under several forms.

*(a)* THE CADENCE, κατ’ ἐξόχην,—to be called the Full Cadence when a distinction is required; from a dominant to a tonic prime. Its several representative cadences are classed under the same heading.

The reverse of the Cadence, from a tonic to a dominant prime, is the Counter-cadence.†

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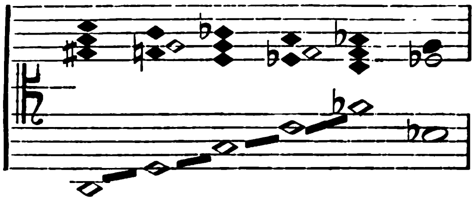
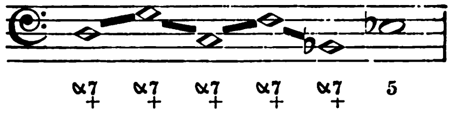
[*] The term, "half cadence," is applied indiscriminately in the books, to the monochordal cadence, from sol to mi, and to the bi-chordal counter-cadence, from Ut to Do-sol.

[†] Commonly called the "half cadence." It has already been shewn that the true half cadence is of entirely different construction.

*(b)* The Continuous, or Chain-cadence; from dominant to dominant.



or,



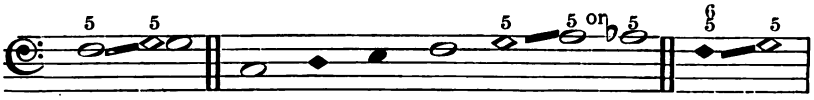
The chain cadence is formed by adding the appellative bemol to the chord of the tonic member of a full cadence; thus changing Ut into Do-sol, and enforcing further cadence.

The chain cadence may be carried on at pleasure, basing a chromatic progression, until final resolution.

The chain cadence may be likened to the Sorites of logicians,—a string of syllogisms in which the predicate of the first proposition is made the subject of the next; and so on, to any length, till finally the predicate of the last of the premisses is predicated (in the conclusion) of the subject of the first.

*(c)* The Broken, or Abrupt Cadence; so called after the break in the scale. This cadence is abnormal, being formed by the gradual* ascent of one prime to another prime. The progression of this cadence, being abnormal, cannot be so distinctly mapped out as those of the other cadences; but it may be roundly stated to be, when by a tone, from Fa to Do-sol, or to Ut, as the case may be; and when by a little tone from Do-sol of one key (going out as bequarre) to Ut of another key.

The broken cadence takes place, for the most part, on the fifth and sixth degrees of the scale, which are thus converted into the fourth and fifth, or seventh and eighth,† of a new key, by real or transient modulation.



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* Gradual,—*i.e.*, diatonic, by a tone or by a little tone. This involves consecutive fifths, which have to be disguised as best we may.

† This is in accordance with the received rule of bass "Terminations," which is as follows :—

"We ascertain what degree of the scale a bass note belongs to, by 'Bass Terminations.' Of these there are four; two by an ascending, two by descending movement.

A termination is a bass which ceases to ascend or descend by diatonic or chromatic progression.

When a bass terminates by ascending a whole tone, the first note of the termination is a fourth of the scale; the second, a fifth.

When the bass terminates by descending a whole tone, the first is the second of the scale, and the second, a tonic.

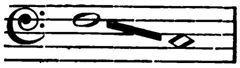
When the bass terminates by descending a half tone, the first is the sixth of the scale, in a minor mode, and the second is the fifth.

When the bass terminates by ascending a half tone, the first is the seventh of the scale, and the second is the eighth."

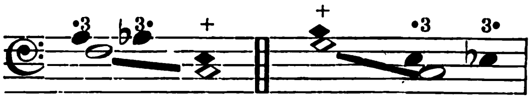
Prime F, bearing 5, must not be confused with overtone f, bearing 6; for overtone f is flat seventh on G, and may legitimately proceed to g, one tone above, which is only a replicate of the root. For nothing takes place but a repetition of the one chord in another position. From bemol to dominant is a monochordal cadence; essentially differing from the Fa Do-sol cadence, which is bichordal.

The bringing in of Fa, as prime, to go out as bemol, is the artifice by which the gap caused by the "break" in the scale is bridged across. This will be more plainly shewn when we come to treat of the chord of the great sixth.

*(d)* The Plagal Cadence. The name must be retained, because of the many associations connected with it. But it is not, in reality, a separate form of cadence; being merely an upper counter-cadence: *i.e.*, from Fa, upper tonic and fourth of the scale, to Ut, which accordingly becomes a dominant for the nonce.



Fa, being tonic, takes the major or minor third indifferently: Ut, converted into Do, takes necessarily the sharp third, even though the cadence imply the minor mode. Now the sharp third has hitherto been confused with the major third. Bearing in mind that the plagal was formerly the most usual cadence, we now see how the practice arose, through over-generalisation, of terminating a minor strain by a major chord. The practice has been extended, without cause, from a plagal conclusion, where the sharp third is imperative, to a conclusion by full cadence, from dominant to tonic, upon which the third is mutable,—major or minor. By way of example, according to the mode of figuring already indicated, the Plagal Cadence and the Full Cadence, or cadence proper, are here set out, together with the thirds appertaining to each.



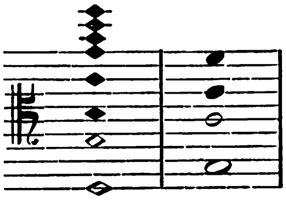
In despite of great authority, I am unable to reconcile myself to the major third, simulating a sharp third, at the conclusion of a minor strain, *by full cadence*. For, by that very simulation, it partially destroys the tonality of the final, imparting to the key-note the character of a dominant.

# CHAPTER XV.

## DERIVATIVE CHORDS.

It has already been shewn that the normal chords are two in number: the Great Chord, on the dominant; and the Triad, on the tonic.

From these all the chords in use,* granting their minor varieties,† are derived.



The notes of the Great Chord are equivalent to 1, 3, 5, 7, 9, 11, 13, and are susceptible of inversion.

The notes of the Triad are equivalent to 1, 3, 5.

Any portion of the Great Chord,‡ consisting of at least three notes,‖ is a chord. The number of dominant chords at disposal thus becomes evident, on inspection. To these appertain their respective inversions; also their minorized varieties.

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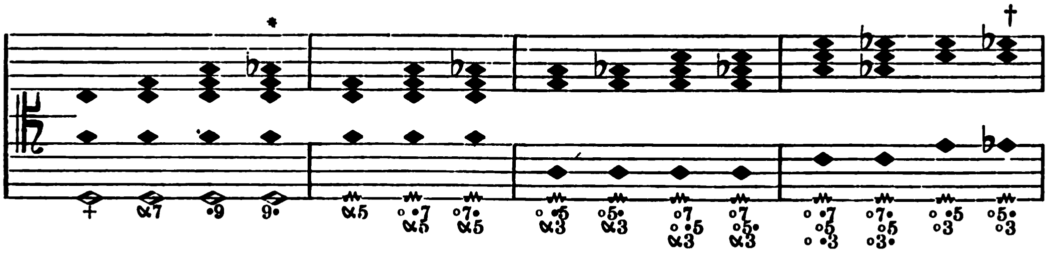
* Excepting one, a compound Chord, called the Chord of the Augmented Sixth. It will presently be analysed.

† By postulate.

‡ The full chord is not practised, because the ear is incapable, or nearly so, of distinguishing so many simultaneous sounds.

‖ It is commonly maintained that a trinary combination constitutes a chord, but that a binary does not. There is a certain awkwardness about this, though no sufficient cause for amending the vocabulary. But the word itself involves an etymological error.

In their uninverted form they are as follows :—



It will be observed that the figuring is precisely distinctive throughout; that no one chord can be confused with any other chord. Other combinations, looking like chords, are found, but these result from anticipation or retardation; from passing or exchanging notes. A real chord contains no discord.

---

* It has already been assumed, that the only mutable note is the third upon a tonic; in other words, mi or la, the third and sixth of the standard scale ascending. Therefore, the chord notes do-la, do-ut, and do-mi, are seemingly not mutable. But do-la, the chord note (allowing for temperament) is also la a scale note, which may be minorized. It appears to me to be in virtue of this association that the ninth and thirteenth upon the dominant are either major or minor; but that the eleventh remains immutable. The real difficulty is about the thirteenth; for the minorization of the ninth can be otherwise accounted for.

† From this, in an inverted form, results the chord commonly known as the Neapolitan Sixth.

# CHAPTER XVI.

## MONOCHORDAL AND BICHORDAL INTERVALS.

These two classes of intervals, though of nature essentially different, shall be treated together, for the sake of the contrast.

Monochordal intervals are played harmonially,—*i.e.*, simultaneously: bichordal intervals melodially,—*i.e.*, in sequence, cadentially.

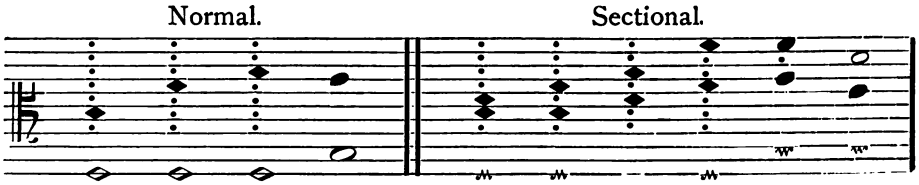
The former may at any time be played in sequence; but then they are in the nature of an arpeggio. The latter may sometimes be played simultaneously, but then (with the exception of those that are common to both classes)* they are in the nature of discords. Monochordal intervals are never more than dissonant.

By use of the peculiar notation adopted in this Work, the distinction is presented to the eye. Where both notes of an interval are of the same form, either square or round, the interval is monochordal; where the two notes are of different forms, the interval is bichordal.

Monochordal intervals are distinguished as Normal, and Sectional.† Normal intervals are those based upon a prime, or the replicate of a prime. Sectional intervals are those based upon an overtone.

Minorization, not only of tonic thirds, but also of the ninth and thirteenth on the dominant, is granted.

The following are examples of the numerous combinations that can be made.



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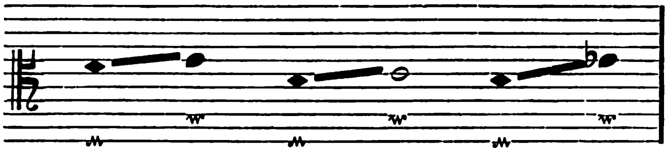
* By reference to the bichordal diagram, it will at once be seen which are distinct, and which are common.

† Thus the real nature of such intervals as the flat fifth, about which there has been dispute, becomes apparent.

It thus appears that each interval has its own appropriate place in the scale;* its own intonation,—*i.e.*, stretch, span, or comparative ratio of vibrations, and its own peculiar character,—*i.e.*, effect upon the ear; unmistakable when upper dissonances are used.

Bichordal intervals are not subdivided into classes, but are taken as they occur on the scale. Minorization is still allowed for.

The following are examples:



So much for generic distinction of intervals. Specific distinction has now to be made,—the finding of a name for each interval that as nearly as may be shall express its quality.†

Intervals, in default of a perfect musical vocabulary, for which the time has not yet arrived, shall be distinguished as in the following diagrams; not merely according to their width, but according to their meaning.

The immediate object will be to frame the distinctive terms as precisely as those of heraldry, in the blazon of which there is not a superfluous word used, or a descriptive word omitted; exactly as in figured bass, where our first care should be to make the signs as precise as those in algebra.

A few preliminary remarks may facilitate the reading of the diagrams.

It will be observed that the terms, major and minor, are restricted to their modal signification, being no longer used as greater or lesser; that the fourth of the scale, ascending, is treated as the upper tonic; descending, as bemol,—a flat note. The seventh, ascending, as a sharp, or leading note. That the mutable notes, mi and la, may be treated either as tonic notes, major or minor thirds based on the first and fourth of the scale; or as ninth and thirteenth, major or minor, on the dominant. Consequently, that there are two species of minor fifth, of different intonation; the one dissonant, the other discordant. That diminished intervals are described as minorized notes based upon a sharp seventh; and augmented intervals, custom notwithstanding, as inversions of diminished intervals. Superfluous intervals, so-called, are not acknowledged, being abnormal.

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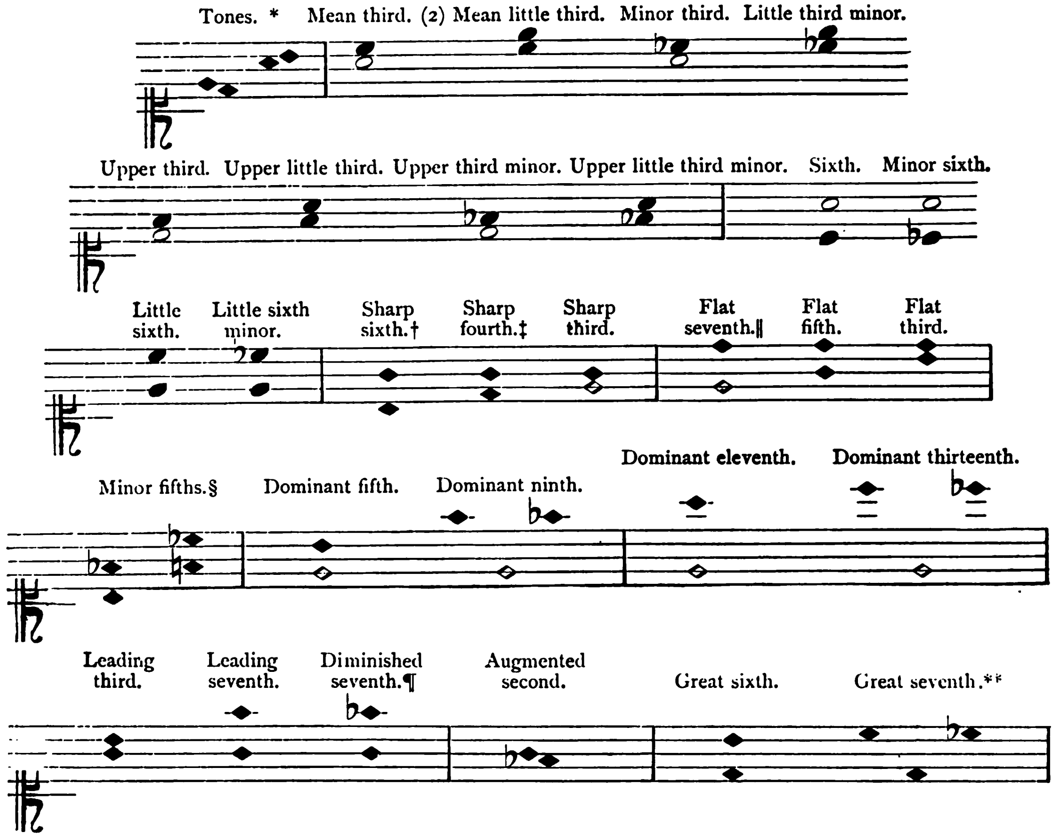
* This is at variance with the usual method of classification, as augmented, major, minor, and diminished intervals, taking extent only into consideration. It looks very neat, but covers only a portion of the ground. The effect upon the ear of the minor fifth, on the second or sixth of the scale, is very different from that of the flat fifth, on the seventh of the scale. Still more different is that of the so-called perfect fifth, on the third of the scale, from that of the fifth on the first. The fifth on e, seemingly in the key of c, if it be not utterly abnormal, is a superfluous flat fifth, in f. To a contrapuntist, both are perfect fifths: not so to a harmonist.

† This will involve the use of more words than we are accustomed to; but this is a trifling inconvenience if weighed against that dull uniformity of nomenclature to which we have hitherto been subject, and which seems to have reacted on our perceptions.

By reference, however, to the vocabulary, it will be seen that general terms are supplied for common use, on occasions where exact specification is not required. Thus a "greater third" covers the sharp third and the major third; a "lesser third" covers the little third, the minor third, the flat third, and the diminished third; which all, nevertheless differ essentially in quality.

MONOCHORDAL INTERVALS.



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* It must be noted that neither of these tones are identical with those we read of in the books,—the 9 : 8 tone, and the 10 : 9 tone. Yet they are the only tones made use of in harmonic combinations. G—F is an inversion of the seventh on the dominant; equivalent to C—♭B. But C : ♭B :: 8 : 7. Its use is in the chords of $^4_3$ and $\propto^6_5$.

C—D is an inversion of the seventh on the second; C being an eleventh on dominant G. Now C, the eleventh on G, is not C of the scale, but sharper, being as 33 : 32. Its use is in the chord of $^6_5$,—the great sixth.

† Commonly called, the Little sharp Sixth.

‡ Or Tritonus.

|| Flat seventh; also Dominant Seventh; two names for one interval, and not in this instance alone. The nomenclature must still remain imperfect. It needs as effectual treatment as that prescribed for Ireland:—twenty-four hours under water. I have only sought to cure misleading errors.

§ The minor fifth must be carefully distinguished from the flat fifth, with which it is frequently confounded. Both the minor fifth and the flat fifth find place in the chord of the diminished seventh.

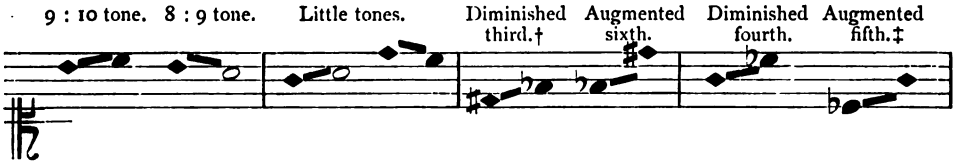
¶ ♭ La is either a minor ninth on a dominant, or a minor third on tonic Fa; the intonation differing accordingly. When treated as a diminished seventh, ♭la is a dominant overtone.

** So called, as fellow to the Great Sixth; each alike being played on bemol, to which the dominant, suppressed, is prime.

It will be noticed that there is no diminished fifth, for bemol cannot be minorized. The fifth on bequarre is a Flat Fifth.

### BICHORDAL INTERVALS.

It has been already observed that these are in the nature of discords. They differ from monochordal intervals in this,—that whereas the two notes of each monochordal interval spring from one root, and may therefore be combined harmonially, each separate note of each bichordal interval has its own particular root, bears its own particular chord, and must therefore be used progressively.*



These are examples only; the combinations being too numerous for nominal distinction.

The two bichordal tones are absolutely discordant. The two monochordal tones, differing in ratio from these, are only dissonant.

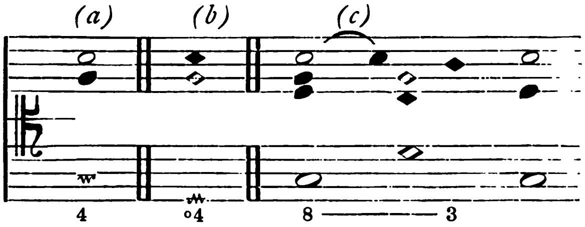
Let not this distinction of intervals be called frivolous, because mindful of small matters. It is thus that searching analysis is attained. These same small matters, watchfully and farsightedly observed, oftentimes rise to importance. Even where they do not, nothing is lost by a prudent reminder.

The real fourth, excluding the sharp and the diminished fourth, is of three species. There is a consonant fourth, a dissonant fourth, and a discordant fourth.

The consonant fourth (*a*) is from sol to Ut,—*i.e.*, from the second overtone on prime Ut to the third; a section of the common chord.

The dissonant fourth (*b*) is an eleventh on a dominant,—from the seventh overtone to the tenth; from Do to do-ut. Preparation is not imperative.

The discordant fourth (*c*), is a discord by prolongation (commonly called suspension), taking place, for the most part, on the dominant. It were pleonasm to say that it must be prepared; it *is* prepared by the very condition of its existence.



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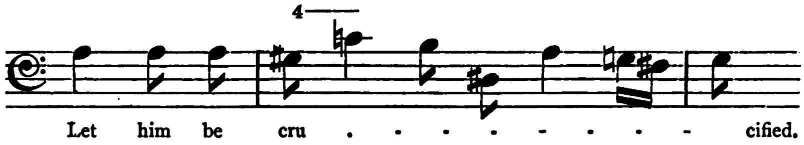
* The chord of the Augmented Sixth, which looks like an exception, will be considered in its place.

† The diminished third is an abnormal interval, in two keys at once; unless the fourth of the scale, ascending, be accepted as an "equivocal note." *Vide infra.*

‡ Systematically, the proper place of the Augmented Fifth, which is only an inversion of the diminished fourth. The interval is of rare occurrence. C—♯G, common enough, is not an augmented, but a superfluous fifth; an abnormal interval, the ♯G being either a passing or an exchanging note.

Observe, that in the consonant fourth, both notes are tonic; that in the dissonant fourth, both are dominant; and that in the discordant fourth, one note is tonic, and the other dominant.

The following is a melodial example of the rare diminished fourth. It is taken from Bach's *Passion of St Matthew*, No. 59.



It will be observed that the second interval on bequarre, namely ♯re—la, is not a diminished interval, but the ordinary flat fifth.

According to the foregoing classification,

1. The mutable notes, mi and la, form major or minor intervals.
2. Bemol forms flat intervals.
3. Bequarre forms sharp intervals.
4. Do-sol, as a bass, bears dominant intervals.
5. A minor note, based on bequarre, forms a diminished interval.
6. An augmented interval is the inversion of a diminished interval.
7. A leading interval, by way of ascent, is based on bequarre; the lead from below.
8. A great interval is based on bemol, through which the extension is obtained, and a down-leading progression.

Thus, with consistency of system, may the intervals in use be grouped.

# CHAPTER XVII.

## THE FIFTH AND THE FOURTH OF THE SCALE.

We may now indicate the various aspects under which the fifth of the scale, and the fourth, may be viewed.

By the preceding paradigms it has been shewn that the fifth of the scale assumes a threefold character, being accompanied as tonic,* as dominant, and as an overtone to Ut. Sometimes it comes in as tonic, and goes out as Dominant.

As tonic it bears $\cdot\genfrac{}{}{0pt}{}{5}{3}$, or $\genfrac{}{}{0pt}{}{5}{3}\cdot$ , the third being mutable—major or minor.

As an overtone, it bears $\genfrac{}{}{0pt}{}{6}{4}$.

As dominant, it bears $_{+}\genfrac{}{}{0pt}{}{5}{3}$, the third being necessarily sharp; for the flat third would convert the chord into a chord of the seventh on the second, and the minor third would convert the dominant into a tonic. It also bears the flat seventh, and the upper overtones,—the ninth, major or minor; the eleventh, immutable; and the thirteenth, major or minor; all which, being dissonances and not discords, may be taken without preparation.

Thus it appears that the fifth of the scale, in one form or other, can bear all the notes of the major or of the minor scale; that is to say, (in the key of C,) $\flat$e, $\flat$a, and $\flat$b, in addition to all the naturals.

For this cause, the legitimate Pedale, or drone bass, is the Dominant. Being so largely connected, it is in relationship more or less remote with nearly all that can be played upon it.

The Tonic is occasionally forced into use as a Pedale, the peculiar grinding effect of which results from the comparative paucity of its overtones. For so soon as you play a flat seventh on a tonic note, that tonic forthwith becomes a dominant. In fact, where a Dominant Pedale bears dissonances, a Tonic bears discords.

A tonic pedale is moreover not in accordance with the æsthetic character of the Tonic. The character of the Dominant is, expectation; that of the Tonic is, achievement. "Achievement is command," and command is, or ought to be, conclusive. Therefore the Dominant is capable of prolongation, in contrast with the Tonic, which waits for nothing. The pedale on a tonic note, unless used for the express purpose of obtaining a certain desired effect, is unsatisfactory; "dragging its slow length along," seemingly for no conclusive purpose.

The fourth of the scale is beset with complication. This note also assumes a threefold character; being upper tonic (commonly called subdominant), bequarre, or bemol.

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* Notably in the descending scale.

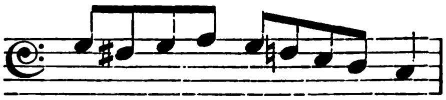
We have seen how it becomes bemol in the descending scale; it shall now be shewn how it may become bequarre in the ascending scale.

This will be to many a violation of the sacredness of the modern gamut-scale:—

*Quis desiderio sit pudor aut modus*
*Tam cari capitis,*

but the inexorable logic of consequence does not brook denial.

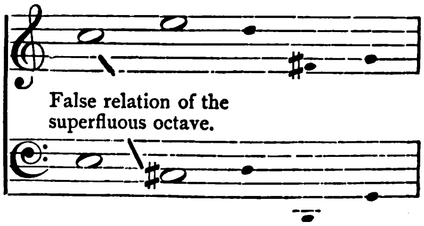
It has been already observed that the prime fifth of the scale is sometimes tonic, and sometimes dominant. Corresponding to this mutability is that of the fourth of the scale, which is accordingly either bequarre, or bemol; as in the following—one of the commonest of phrases:—[*]



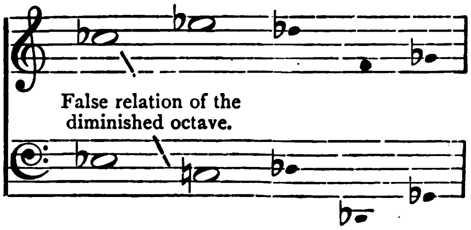
The fourth of the scale may conveniently be called, the "equivocal note."[†]

The "equivocal note" looks like an innovation, but is not so in reality; for the ♮f and the ♯f of the scale are manifestly analogous to the ♭b and ♮b of the Greek conjunct and disjunct tetrachords.

By aid of the two-faced fourth,—that Janus of the scale, we are enabled to give an informal sanction to the diminished third, the seat of which is on ♯fa; to treat the minor third, Ut ♭mi, as a little third in the triad of ♭la;[‡] and to legalise the two cases of cross-relation, instanced by Cherubini as permissible, though without shewing cause.



False relation of the superfluous octave.



False relation of the diminished octave.

The small notes are added, by me, to shew, through completion of the phrase, the place of the equivocal note.

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[*] In reality, a modulation takes place; but, as modulation is held to be from octochord to octochord, and not from tetrachord to tetrachord, this may be termed a half modulation.

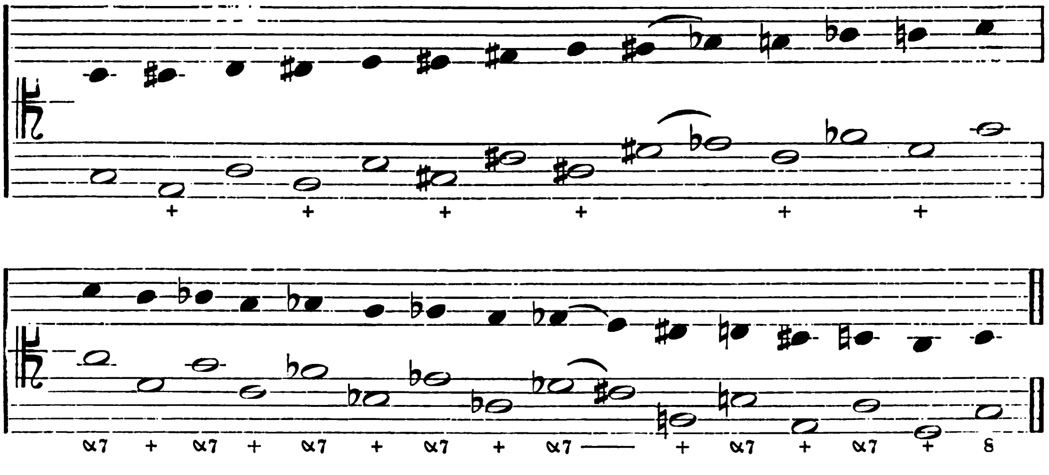
[†] The term "mutable" has been already appropriated to notes that may be either major or minor.

[‡] See page 47.

# CHAPTER XVIII.

## THE CHROMATIC SCALE.

The name may be conveniently retained; but what is so called, etymology notwithstanding, is not a scale in the technical sense of that word. For a scale implies a given Key;* but the Chromatic progression, founded on the Chain-cadence, is composed of a series of changes from one key to another. It looks, however, very like a scale, on paper.



These notes, in appearance so orderly, are mere gatherings, excerpts from various keys, through a series of modulations: from bequarre to Ut ascending, and from bemol to bequarre descending.

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* To speak with absolute precision, it must be admitted that the standard scale is in at least two keys. By aid, however, of an artifice already mentioned, the impression of a single key, ascending, is maintained. The Chromatic series, on the other hand, makes no pretence to modal unity.

As usual, we are met by one of those recurrent questions of degree, which paralyse us so soon as we pretend to exact terminology.

Nevertheless, though theoretic symmetry be yet to seek, we are not without the means of obtaining practical command over the half tones. By means of the equivocal note, Fa, or ♯f; of the mutable notes, mi and la; and of bemol (♭b, of the upper cadence), we are enabled to account for all the half tones of the clavier scale save one: there is no ♭re. For ♭re, leading to Ut, forthwith converts Ut into a dominant, becoming itself the minor sixth of a new scale. Nor can we interpolate ♯ut between Ut and re; for another modulation is thereby involved.

I know not how to make a nearer approach to a "chromatic scale" than this. That is to say, by strict deduction of every note, as heretofore, and *without going out of the key.** Of course, by borrowing and interpolating accidentals from other keys, we can obtain as many flats and sharps as we please. But they are not rightfully come by. We borrow after the manner of the Israelites when leaving Egypt.

All the half tones on the clavier may be obtained by transposition of this scale.

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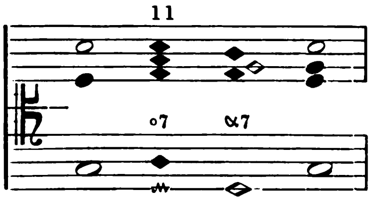
* That is to say without quitting the three cadences which underlie the octochordal scale. It has already been observed that modulation is really from tetrachord to tetrachord; but that as yet we must take that word in its usual acceptation,—from octochord to octochord.

# CHAPTER XIX.

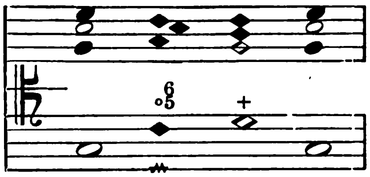
## The Dissonant Chords.

The Dissonant Chords are those which are compounded with dissonant overtones, or are wholly composed of them. They commence with the chord of the leading seventh, on bequarre, or of the diminished seventh, on the same, advancing upwards to the last overtone in use, corresponding to the thirteenth on the dominant. Among these, the chords of the Great Sixth,* the Augmented Sixth, and the Neapolitan Sixth demand especial attention. D'Alembert's treatment of the Great Sixth, by what he calls "Le double emploi," is ingenious, though very complicated. But he was cramped by restriction to the third and fifth, or at most the flat seventh.

The chord of the Great Sixth is the first inversion of the chord of the Seventh on the second; which is itself a section of the chord of the eleventh, based on the Dominant.

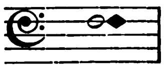


or,
inverted.



From this it appears that in the chord of the great sixth, the fifth and not the sixth (as we read in some of the books) is the dissonant note.

It is by means of this chord that the gap of the broken cadence is bridged across. The connection is effected by causing Fa to enter as prime, bearing 5, and to go out as an overtone, bearing 6. The overtone is bemol, resolving upwards, by half cadence, on G. By monochordal, or half cadence, because the G is replicate to the root of bemol.



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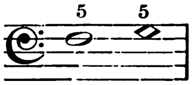
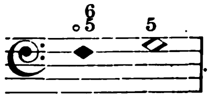
* This Sixth is called "great," because based on a flat note; the greatness resulting from extension downwards.

The result is, that  constituting the broken cadence, is treated as synonymous with .

There is, however, something of unreality and artifice about the connection. We have succeeded in "making a splice," and nothing more.

Thus is accounted for the seemingly false progression of ♮f to G, instead of to e,—the "anomaly of the rising flat." For the G does not follow ♮f bi-cadentially, *i.e.*, from a tonic to a dominant chord, or *vice versa*, but merely by a change in the position of the notes of one and the same chord. The same, however different in appearance, because based on the same root. This progression, usually supposed to be a license, is therefore strictly legitimate.

The chord of the Augmented Sixth is ungrammatical; but, because of its transcendent force, it may claim to use the German emperor's retort,—*Rex sum, et super grammaticam.* Let us try how nearly we can reduce imperial grammar to order.

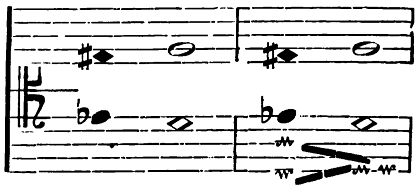
The most pungent of chords, it is also the most versatile; not only because of its triple variation, but also for its synonymous* correspondence with the flat seventh.

Being abnormal, it defies systematic analysis; such at least as we have hitherto been able to apply. As usual, the difficulty is in the faulty use of words; for the chord, so called, is not a chord, but a discord.

By reference to the table of intervals, p. 61, it will be seen that the Augmented Sixth is not a monochordal, but a bichordal, interval; discordant if played harmonially. Also that each note of every bichordal interval carries its own accompaniment; one note of such interval bearing a tonic chord, the other a dominant chord.

It is evident that if the bichordal interval were played harmonially, one chord would have two roots; which cannot be, for they contradict each other.†

The Augmented Sixth reaches from ♭la, the sixth of the scale, to ♯f, the sharpened fourth of the scale. But ♯f is bequarre, and therefore goes to *tonic* G; while ♭la, minor third on F, goes to *dominant* G.



Thus do we find ourselves at once in the keys of G and of C minor.

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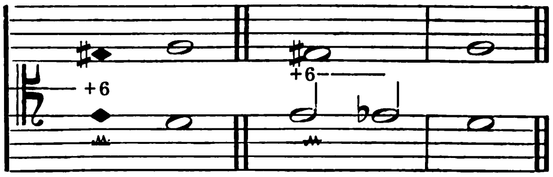
* Commonly called "enharmonic;" leading to one of the most daring of modulations.

† Even if not expressed, they must at least be expressible.

It is evident that the tonic a, minor or major, derived from F, must be abandoned. But there is at disposal another a, the fifth on dominant D. Substituting this a, we obtain with ♯f a leading sixth, resolving normally no longer on a compound, but upon a purely tonic chord.



So far all is in order. But we are looking for an ♭a; and the fifth on a dominant is not a mutable note. I say that ♭a is a passing note, advanced by courtesy to the rank of a substantial note. But it is none the less a discord, though saved according to technical rule.

This is not the only possible solution of the problem. There is yet another manner of construction; more recondite, but affording a more delicate and more characteristic chord. In this, the ♯f, and not the ♭a, is the peccant member.

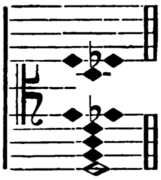
Let it be first observed, in support of the *dictum* that ♭a and ♯f are irreconcilable, that under every aspect of this famous chord, where the ♭a is right, the ♯f will be found wrong; and *vice versa*. Like Falstaff's words and disposition, as contrasted by the merry wives of Windsor, "they do no more adhere and keep together than the Hundredth Psalm to the tune of Green Sleeves."

Instead of taking D for a prime, let us take G. The same notes, at least as written on the stave, will be deduced; but they will be higher overtones, and therefore of different quality.

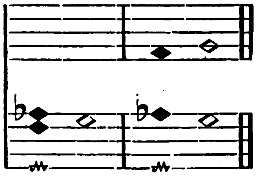
Out of the great Chord, upon dominant G, we obtain a, the ninth; a mutable note,—a or ♭a. It will be remembered that a, when used as fifth on prime D, was immutable.

We then take out of the great chord the flat seventh, and the minor ninth, f—♭a; both dominant notes, resolving on a dominant by monochordal cadence.* Inverted, these notes give a flat sixth, ♭a—f. This is the true chord. But we are looking for a sharp sixth. I say that ♯f is a passing note, advanced by courtesy to the rank of a substantial note.

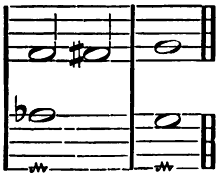
Great chord.



∝7 and 9• Inverted.



Passing note.



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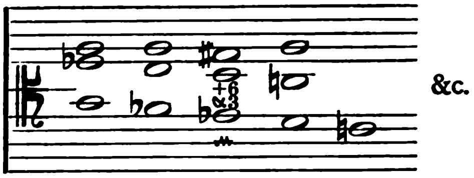
* The ascent of bemol, by monochordal cadence, has already been vindicated.

It will be observed that the cadence of the Augmented Sixth upon ${}_{+3}^{5}$ is monochordal. There is also a bichordal cadence upon ${}^{6}_{4}$. Of this, there will presently be more to say.

The full chord of the Augmented Sixth comprises three well known varieties,—commonly called, the Italian Sixth, the French Sixth, and the German Sixth. These are easy of analysis, if it once be granted that the congenital defect—♭a in discord with ♯f, is cured by the device to which we have been compelled to resort.

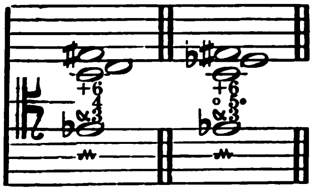
Harmonizing the descending minor scale, we obtain the Italian sixth (*a*) on ♭a, with D for a root.

(*a*)

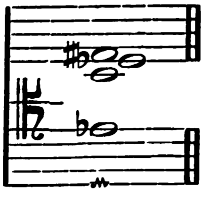


Adding to this the replicate of the root, we obtain the French Sixth (*b*). Substituting for this replicate the minor ninth upon the root, we obtain the German Sixth (*c*).

(*b*) (*c*)



Taking G for a prime instead of D, according to the second method of construction, we obtain the same notes on the stave, but the flat seventh and minor ninth upon D become the eleventh and minor thirteenth upon G. To realise the peculiar quality of this chord, the root must be played.



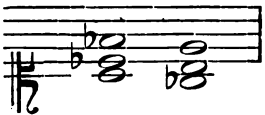
There is no more instructive chord, if exhaustively treated, than the chord of the Augmented Sixth. But it does present a real difficulty; and to those who care not to track up the solution, step by step, it becomes the *pons asinorum* in music.

I cannot expect many to follow me through these niceties of differentiation; but it is better to err on the side of minuteness than of carelessness. The most essential condition to enquiry is exactitude.

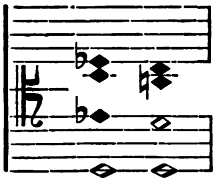
The Neapolitan Sixth is seemingly more complicated in form than the Augmented Sixth ; but is in reality, more easy of analysis. For, if minorization be granted, it is strictly regular.

A distinction must be drawn between the Neapolitan Sixth, and the Neapolitan Sixes. The sixth may be followed by many chords ; but the sixes are gemells ; the second of the two necessarily minor,—*i.e.*, characterized by a minor third on the root.

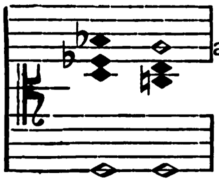
Let us take the "sixes" as follows, and begin with examining the first of the two. In which key is it, and where is the root of the chord ? For this, the *status* of the two flattened notes (in the first of the two chords) must be ascertained. Let us begin by saying what they are not. They are not, if taken together, the minor third and the minor sixth of a *scale*. There is but one prime that can bear both ♭a and ♭e, *if treated as scale notes*, to the exclusion of the upper dissonances—namely ♭A itself.



I believe that the depressed sixth of the chord, namely, ♭a, is the minor ninth on dominant G. But what becomes of ♭e and c, which cannot be borne as scale notes, by dominant G ? The solution is that the notes in question are upper dissonances on G : ♭e being a minor thirteenth on G ; c being the eleventh on G ; ♭a, the minor ninth on G, becoming, when transposed to the upper part, a sixth on the eleventh c.

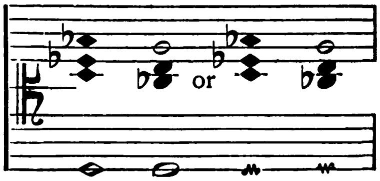


To proceed step by step, take the minor thirteenth with the minor ninth, and resolve, by monochordal resolution.



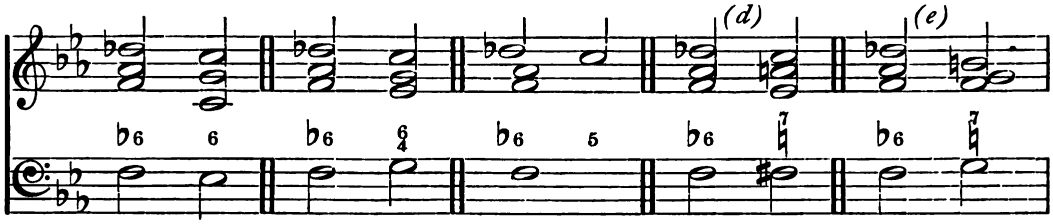
Transpose the minor ninth, thus obtaining the first of the "Sixes," and resolve.

To obtain the second of the sixes, flatten the ♮b, making it a minor third on the root G. But G, which was dominant, becomes tonic so soon as a minor third is applied to it ; for a dominant necessarily bears a sharp third. This of course implies that the first of the Sixes is in C, and the second in G.



To this solution is appended another by Sir John Goss, and a third by Sir Frederick Gore Ouseley. Goss writes as follows :—

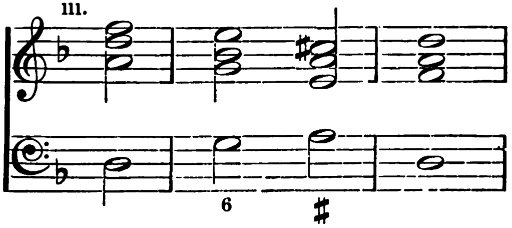
"The chord of the Neapolitan 6th, which occurs upon the subdominant, consists, besides the bass note, of a minor 3rd and minor 6th. It may be followed by various chords, as seen in the following example: its 6th and 3rd usually descend a semitone; at (*d*), however, the 3rd ascends a semitone, and at (*e*) the sixth descends a diminished 3rd."



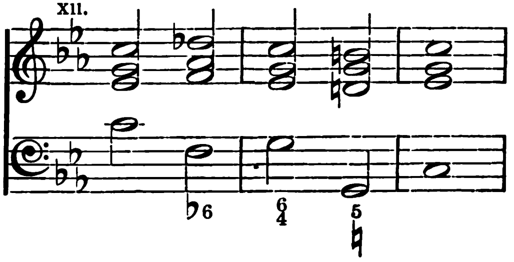
This solution cannot be admitted, for a subdominant is prime, bearing 5.* It does not bear even the great sixth; much less a minor sixth which does not exist. For re cannot be minorized. The second of the scale, when flattened, proceeding to the tonic, converts that tonic into a dominant, having itself become the minor sixth of a new scale.

Sir Frederick Ouseley comes nearer, by one step. In his examination of the varieties of final cadence, he gives, among others, the adjoined examples; "retaining," in No. iii., "the subdominant chord," but "omitting the seventh of the supertonic;" and in No. xii., introducing the sixth in question, which he explains as follows :—

iii.



xii.



"On comparing our new chord in No. xii., with that in No. iii., it will be seen that the only difference is the accidental depression of one interval, viz., the fifth of the dominant root G."

"But this interval so depressed forms no part of the harmonic series of G."

"All the rest of the chord, however, belongs to it."

"From what note then is this obtruded D♭ to be derived?"

"Clearly from C, of which it is the minor ninth."

"But judging from the analogy of the double root chords explained above, one might think that the double derivation of the chord from the two roots $\genfrac{}{}{0pt}{}{G}{C}$ would lead us to consider it as belonging rather to the key of F, of which those roots are respectively the dominant and supertonic."

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* It has been already shewn that fa, bearing the great sixth, is not subdominant.

"And to a certain extent this is true; and thus we see a connection between this cadence and the plagal cadence, where a transient modulation into the key of the subdominant actually takes place."

"This new chord is then originally, though remotely, a subdominant chord, though actually built on the tonic and dominant; and whatever elements of modulation it may possess are neutralized by the essentially dominant character of the rest of the cadence."

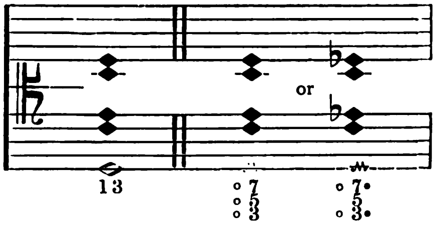
"Such then, is the analysis of this remarkable and very beautiful chord."

The quotation has been made for the purpose of shewing the extreme complication of this chord, and the difficulty of its analysis. But the assumption of "two roots," with their clashing overtones and difference notes, ought not to be allowed until it shall have been clearly shewn that any other solution must fail. I have endeavoured to find the means of return to orderly procedure.

It thus appears that the dissonant overtones are *necessary* to any complete system of harmony; the ninth, the eleventh, and the thirteenth being respectively the keys to the chords known as the German Sixth, the Great Sixth, and the Neapolitan Sixth.

This mention of the dissonant overtones may be concluded by inviting attention to a chord—a very grand one, which seems to have escaped theoretical notice. It is the chord of the Great Seventh,—to be called "great" for the same cause by which $_{\circ}{}^{6}_{5}$ is called the Great Sixth; for both alike are widened by being based on a flat note.

The Great Seventh is a seventh upon the fourth of the scale,—*i.e.*, upon the seventh of the dominant chord. It is doubly major or minor.


or
13
$\circ 7$ $\circ 5$ $\circ 3$
$\circ 7\bullet$ $5$ $\circ 3\bullet$

There is a peculiarly plaintive quality of sound about all chords formed partly or wholly from the dissonant overtones which at once establishes their individuality. The effect, if sought for, will at once be recognised by a trained ear.

# CHAPTER XX.

## POSTULATES.

Let us now collect and place in juxtaposition the demands that have been already made, from time to time, as occasion arose.* They are as follow :—

i. The arrest of the series of overtones at the twenty-seventh : *i.e.*, at the thirteenth note (upon the clavier) above the prime.†

ii. That replicates are equivalent.‡

iii. That notes differing only by a komma are equivalent.||

iv. That each overtone may represent its prime.§

v. That the overtones above the seventeenth are appellative.¶

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* It would have been more orderly to have begun with the series of postulates. But they would have needed too much explanation. The demands have been made as they occurred, to be presently gathered together. A few words will now suffice to make clear their meaning and intention.

It has been already observed that "music is a series of compromises with the ear." The object of postulates is to legalize these compromises. It is moreover well to acknowledge boldly each arbitrary assumption,—to shew compendiously how much of the science depends upon assumption, how much upon demonstration.

† This postulate eliminates a question of degree. The series is infinite ; but, for practical purposes, we must stop somewhere. I have elsewhere assigned a cause for this arrest. To as many as accept it, the proposition is no longer a postulate ; being susceptible of proof.

‡ They become so by compromise with the ear. By aid of this assumption we are enabled to concentrate the widely scattered overtones within the limits of an octave.

|| That is to say, by any one of the various Kommas. In other words, synonymous notes are treated as identical. *De minimis non curat lex.* The effect of this postulate is to legalize the "double treatment" [*le double emploi*] which begins with e-la-mi, at the juncture of the tetrachords, and is extended to what are commonly called "enharmonic changes."

§ By aid of this postulate, a thorough-bass may be substituted for the ground-bass.

¶ It has been already observed that *all* overtones are more or less appellative. The postulate settles another question of degree.

vi. That the latter note of the bichordal cadence proper is a resting note.*

vii. That every normal representative cadence resolves within its own Pentechord.†

viii. That a tonic prime may bear a minor third.‡

---

* That is to say, intransitive. The effect of postulate vi., taken in conjunction with postulate v., is to free us from all overtones (except replicates) on the tonic, above the seventeenth. For, if the twenty-first, which by postulate v. is appellative, were sounded on the tonic, it would convert that tonic into a dominant, from which we must of necessity pass to a new tonic, by way of cadence. But Ut is assumed (postulate vi.) to be final and instransitive.

Therefore the admission of the twenty-first,—that is to say, the appellative flat seventh, on Ut would be inconsistent with the postulate.

† This compels the resolution of bequarre on Ut, and of bemol on mi.

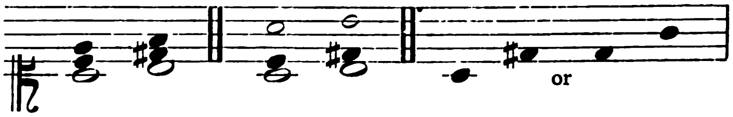
‡ Thus we obtain, as minorized notes, ♭mi, and ♭la, upon the mean and upper tonics; also, in the descending scale, ♭si upon sol, which, by transient modulation, has been converted into Ut. No other "artificial depression" is asked for, or need be acknowledged.

Thus, it follows, that there is no ♭re. Also, as a corollary, that a minor second (so called) cannot be played unless as a discord, upon a tonic; for there is none to play. When such combination occurs, it is upon a dominant.

## CHAPTER XXI.

### FIFTHS, EIGHTHS, AND MI CONTRA FA.

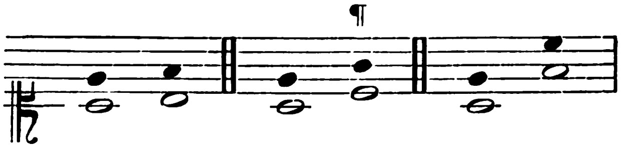
Consecutive fifths or eighths, *if upon primes,* and mi contra fa, are tainted by one and the same fault. In all alike an irregular succession of greater thirds occurs; either expressed or implied; the second of the two becoming a leading note into a new key.*



Consecutive fifths are not cadential:†—that is to say, they will not occur in any bichordal cadence. The same of eighths;‡ and of mi contra fa.||

All fifths are not equally objectionable;§ their imperfection is a question of degree. Our object should be, in each particular instance, to find the measure of such imperfection.

i. The most offensive are, on primes proceeding by a whole tone; by skip of a third; or of a sixth.



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* It has already been observed that the passage from one tetrachord to another changes the key.

† The occurrence of consecutive fifths or eighths is proof that the harmony is ungrammatical. They are not the cause, but the result of bad harmony. They are bad, because they depart from the "Canon of the Cadence."

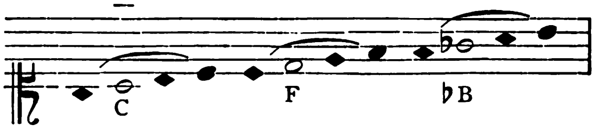
‡ The fault commonly attributed to consecutive eighths is, that they are ineffective. This should rather be termed a weakness, than a fault. The old masters would sometimes omit the third from the chord of $^{8}_{5}$; undoubtedly weakening the chord, but not committing a fault.

|| Every *mi contra fa* is a faulty cross-relation; but not every faulty cross-relation is *mi contra fa.* There is a faulty cross-relation of a modal, as well as of a tonal nature,—namely, ♭mi contra mi; or ♭la contra la. Or, again, of a minor note of one tetrachord against a major note of the other.

§ Each pair of fifths has to be tried on its own merits. The first consideration is whether a change of key be involved, or not. For all parallel fifths do not of necessity imply modulation. We have generalized in too great a hurry.

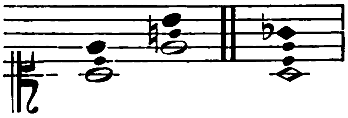
¶ This progression is peculiarly offensive. For if e be regarded as the third of the scale, leading to F, it bears $\alpha^{6}_{5}$; and ♮b becomes a superfluous flat fifth. It will be remembered that e, which comes in as mi, goes out as bequarre.

ii. Fifths by a skip from the first to the fourth of the scale are more bearable, being free from the fault of *mi contra fa.** They are nevertheless faulty in two respects;—that the resolution is not according to the canon of the cadence; and that the c, forming the second fifth, belongs to the tetrachord of ♭B.



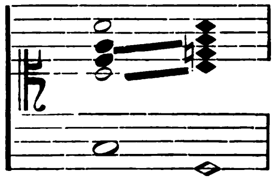
It is not, strictly speaking, a replicate of the C below.

Fifths by a skip from the first to the fifth are more offensive than by a perfect fourth skip; having all the faults of the latter, and one more,—namely, the cross-relation of the first of the scale and of the sharp seventh. For though ♭b may be derived from prime C, ♮b may not.†



Thus far concerning fifths upon primes. Fifths, not both upon primes, are not in all cases unlawful; for they do not imply a sequence of major thirds, or of a major third followed by a sharp third.

The following sequence of fifths has been prohibited, more perhaps for the sake of generalizing a rule, than because of offensiveness.



The imperfection, such as it is, consists in the passage of the scale-note sol, to the chord-note la, which is not in accordance with the Canon of the Cadence.

But these fifths, no longer fatal to good grammar in four or in five parts, would certainly not be permissible in two;* for in two parts the nature of the progression would not be established. The *character* would be unpronounced; gradual primes might be supposed.

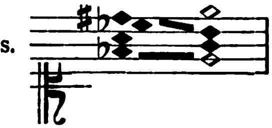
---

* "Two major thirds must not follow each other in the progression of a whole tone, either ascending or descending; but may do so in the progression of a semitone. Neither may they follow each other in a major third skip, as an unharmonious transverse position would ensue *(Mi contra Fa);* but they may do so in a perfect fourth skip." ALBRECHTSBERGER.

† A change of key is too obtrusively forced upon the ear. Albrechtsberger's objection,—difficulty of intonation, is not equally cogent. He says:—"Two consecutive major thirds are equally prohibited with a perfect-fifth skip in both parts, not on account of *mi contra fa,* but because a major seventh then is placed across these two bars or notes, and is always difficult to sing, whether it ultimately ascend or descend."

Consecutive fifths by a progression of lesser tones are not absolutely unlawful.

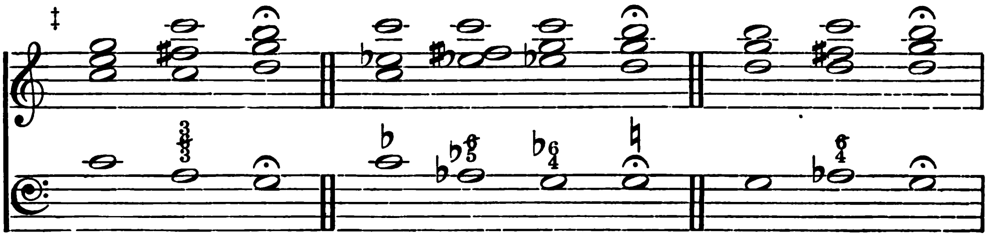
The sequence of fifths in the resolution of the German Sixth has given rise to differences of opinion among the experts.



Albrechtsberger† declares against these fifths.

"La sixte superflue veut, ou la tierce majeure redoublée, ou tierce majeure avec triton (quarte superflue), ou la quinte juste pure, avec la tierce majeure; toutefois, *pour éviter les deux quintes*, celle-ci ne peut être immédiatement suivi d'un accord parfait, mais d'un accord de quarte-sixte."

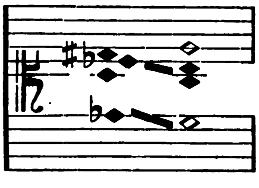
‡



To this passage, Choron appends the following note, declaring in their favour

"Beaucoup d'auteurs tolèrent les deux quintes dans ce cas particulier, et cette tolérance me paraît bien motivée d'abord par cette considération que les deux quintes n'ayant lieu qu'entre la basse et l'une des parties intermédiaires, elles sont peu remarquables et que leur effet est peu sensible; mais une raison plus puissante me paraît encore justifier cette tolérance; c'est que, en général, les deux quintes produisent un mauvais effet lorsque les deux parties procèdent par un ton entier; parce que ces deux parties font entendre à la quinte l'un de l'autre deux chants semblables qui ne s'identifient pas et rendent la modulation indécise. Il n'en est pas de même quand les deux parties procèdent par demiton, parce que dans ce cas le mode étant, par le fait, bien déterminé, l'indécision cesse, et avec elle, le mauvais effet qui en résultait. [Voyez, sur touts ces objets, mon Introduction à l'étude générale et raisonnée de la Musique.]"

The explanation is not quite satisfactory. The question is, how far the procession of each note of the first fifth is cadential. Referring back to our analysis of "The Augmented Sixth," it will be seen that the passage of ♭a to G is cadential in one form of that chord; being a minor ninth upon prime G; while the ♭e is cadential in the other form, being a minor ninth upon prime D. These fifths must, upon the whole, be acknowledged as lawful; but it is well to know the exact amount of the defect.



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* The stringency of the rule against fifths in the extreme parts is because of the prominence thus acquired; causing an impression of two parts.

† The French edition is quoted in order to append Choron's note in the original.

‡ The original figuring is preserved.

When the tyro in composition instances consecutives in the works of the great masters, he is told that they may take liberties, but that he may not. But what is right in their practice, is right in itself. If they transgress rule, the inference is, that the rule cannot be absolute. The departures from rule—we must not call them violations of rule—in their works ought to be collected and commonplaced, with a view to the discovery of a generally permissive rule.

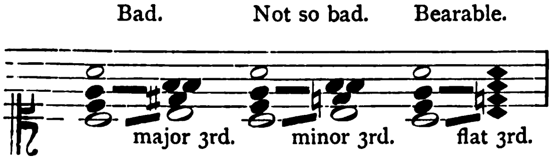
It appears to me, that in the distinction between the monochordal and bichordal cadences will be found a solution of the difficulty.

### THE SAVING OF FIFTHS.

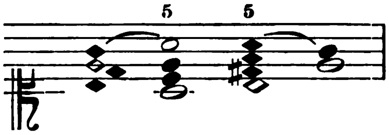
It will be found in practice that the stern rule against fifths cannot be conveniently carried out in its integrity. The question remains, how far may the composer depart from it. We become involved, as usual, in a question of degree.

Fifths may be disguised.* When they proceed by similar motion,† the ear takes full cognizance of the impurity. But when by contrary motion, in a progression of many parts, the fault (for it is still a fault) is bearable: the ear, being confused, does not so readily detect the error.

The offensiveness of fifths may be lessened by destroying the second of the two major thirds; arbitrarily substituting a minor third, or a flat third.



By disconnection; making it evident that the fifths belong to different cadences.



Modern practice seems to be governed by that Spartan rule which is now called "The eleventh commandment,"—Thou shalt not be found out. Hidden fifths are of frequent occurrence; but if the ear be none the wiser, the music is none the worse. Nay, on the "pleasant but wrong" principle, it may be even better. A certain zest may thereby be added; such as, according to a graceless dictum, is given by wickedness to pleasure.

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* They have to be disguised in the standard scale, ascending, which compels a succession of greater thirds: $\overset{a}{f}$, $\overset{b}{g}$.

† Parallel, has been proposed. It may fitly supersede the word "similar," but not the word "consecutive." For there are consecutive fifths by contrary motion.

# CHAPTER XXII.

## THE FIGURED BASS.

Figuring has been ingeniously termed "musical shorthand." But it ought to be something more. Though by no refinement could it be made a substitute for the ordinary notation, it becomes, if intelligently used, a valuable auxiliary, supplementing one of the main defects of that notation, which, while shewing a chord, does not necessarily express its nature, or etymology.* This, through fitly devised figuring, can be shewn at a glance. Thus considered, figuring, now becoming obsolescent, though not yet obsolete, may be still turned to good account, provided that too much be not exacted from it. Any attempt to push it beyond its proper function, in expectation of its fulfilling every condition, can only end in disappointment.

The imperfection which attaches, from its very constitution, to the octochord scale † is reflected in its figuring. But the usual mode of figuring displays more than inevitable faults. It has not even the negative merit of uniformity, but remains a mass of confusion. As many methods as schools.

Choron was the first to point out that there are two manners of figuring possible, differing essentially, and that the figuring in ordinary use is a jumble of both :—

> " Quant au choix des signes qui indiquent l'espèce de l'intervalle . . . . on suit deux méthodes ou systèmes différens, qui sont fondés l'un et l'autre sur la propriété dont jouissent les chiffres et la dénomination d'être communs à l'intervalle et à la note qui le forme.
>
> " Dans l'un de ces systèmes, le signe s'applique à l'intervalle lui-même, et est par conséquent le même dans tous les cas; c'est pourquoi nous le nommons *chiffrage absolu;* dans l'autre, il s'applique à la limite opposée à sa base, et varie selon l'état de cette limite; c'est pourquoi nous le nommons *chiffrage relatif* . . . . Le chiffrage vulgaire n'est autre chose qu'un mélange, plus ou moins confus, des deux procédés que vous venons d'écrire. Il varie selon les temps, selon les lieux, selon les écoles, et selon les maîtres."

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* Of course, by analysis this can be always ascertained. What is meant is, that there is often no distinct presentment to the eye.

† The octochord in use being derived (according to the construction of the bass) from at least two, and more often from three tetrachords, each in a different key.

With the acumen and logical precision that belongs of nature to a Frenchman, Choron seizes on the weak point. I merely suggest that the two systems would be more clearly distinguished, not as "chiffrage absolu," and "chiffrage relatif;" but as "numerical figuring" and "symbolical figuring"—the last being to the former as algebra to arithmetic.

It has been already shewn that Rameau did not fully carry out his own idea, which was nevertheless the right one. It will presently be seen that Choron, though putting us on the right track, did not follow it himself.

The following samples of confusion are all taken from the books. The same symbol of alteration, namely, an oblique line across the numeral—is employed for:—

| | |
|---|---|
| The little sharp sixth | 6̸ |
| The extreme sharp sixth | 6̸ |
| The flat fifth | 5̸ |
| The tritonus | 4̸ |
| The augmented second | 2̸ |
| The diminished seventh | 7̸ |
| The minor third | 3̸ |

And, indiscriminately,

| | |
|---|---|
| For the little sharp sixth | 6, ♯6, +6, 6̸ |
| For the tritonus | 4, ♯4, +4, 4̸ |
| For the flat fifth | 5, ♭5, $\overset{\wedge}{5}$*, 5̸ |

Choron recommends—

| | |
|---|---|
| For minor intervals† | /. ex. 3̸ |
| For major | ⟍. ex. 4⃥ 6⃥ 7⃥ |
| For diminished | ∽∽ ex. ∽ 3, ∽ 7 |
| For augmented | × or +; ex. +5, +6, +3 |

An improvement, but still of a haphazard nature, based upon no principle. The means of expressing the specific character of each primal chord, under any form of inversion, are yet to seek.

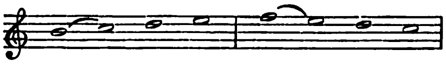
Let us begin by marking the characteristic notes, bequarre and bemol—the sharp third and the flat seventh on the dominant—*in whatever combinations they occur.* These notes are the landmarks of the scale; they have fixed resolutions, and are the extremes of the pentechord.‡

---

* The arc of Telemann.

† Under the heads major and minor, he seems to include flat and sharp intervals, a fertile source of error.

‡ The pentechord is the lesser diapente, composed of the ascending and of the descending tetrachords.



It may be here observed, that with a view to making this chapter complete in itself, occasional repetition of previous *dicta* has been allowed.

♯ and ♭ would serve the purpose ; but these are too much associated with the keys of an instrument.[*] They are also connected with the ♮, called a natural, an ambiguous or two-faced symbol from which confusion is likely to arise.

I propose the substitution of + and ∝[†], to be prefixed invariably to bequarre and bemol.

The next step is to distinguish the mutable notes—*i.e.*, those which may be major or minor. Here we are at once beset with verbal confusion. The terms major and minor are ambiguous—used sometimes conventionally, in a modal sense ; sometimes etymologically, in an extensive sense, implying width or span.[‡]

Let us restrict the terms major and minor to their modal sense ; greater or lesser will suffice to serve the other purpose. Minor notes are thirds lowered by half a tone, based upon tonic primes. Tonic primes are the first and fourth[||] of the scale ascending ; the fifth and first descending. Therefore mi and la may be flattened in the ascending scale, with the addition of si flattened in the descending scale. Thus it comes that in C minor, ♭ E, ♭ A, and ♭ B are consistently figured as minor, in every combination that *does not depart from the key.*

Observe, that the minor third, ut—♭mi, must not be confused with the flat third, re—fa, which is of a nature entirely different. For fa is there bemol.

Let us mark notes forming a major interval by a dot before the numeral ; minor by a dot after the numeral—*ex. gr.*, •3, •6 ; 3•, 6•.

We have now to provide for the chord notes, or upper dissonances,—the ninth, eleventh, and thirteenth. They may be indicated by their numerical distance from the bass, with an o prefixed.[§]

It must be borne in mind that the eleventh is a fixed note, but that the ninth and thirteenth, for reasons assigned elsewhere, are mutable—*i.e.*, major or minor, and are therefore doubly symbolised.

Thus by means of four symbols, +, ∝, •, o, not only the intervals, but also the place in the scale occupied by each of the notes composing those intervals, with the special character of each, are *presented to the eye.*[¶]

---

[*] To arrive at anything like an orderly system of figuring, it is necessary to disembarrass oneself of all associations with the black and white keys of the clavier. Through them it comes that the third upon the dominant is figured in C major, 3 ; in C minor, ♮ 3 ; and in G, ♯ 3. The note, being immutable, should be figured in all three cases alike, by some mark that merely *distinguishes its place in the scale. Ex. gr.*, + 3, + 6, + 4.

[†] The symbol writes well, and sufficiently resembles, though it cannot be confused with, a flat.

[‡] From this comes the strange anomaly that the minor third, ut—♭mi, inverted becomes a major sixth, ♭mi—ut.

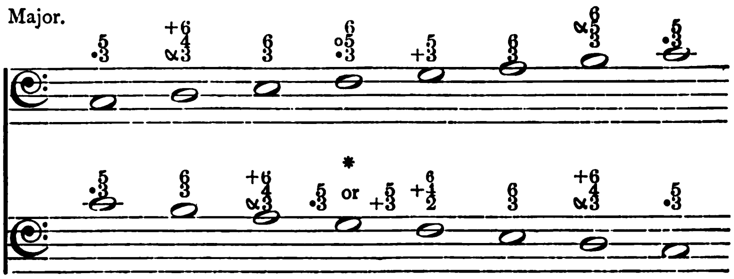
[||] Fa, called sub-dominant, is, upon the tetrachordal system, an upper tonic. Sol, descending, comes in as tonic, and goes out as dominant.

[§] An o is the symbol appropriated to harmonic notes in fingering fiddle music.

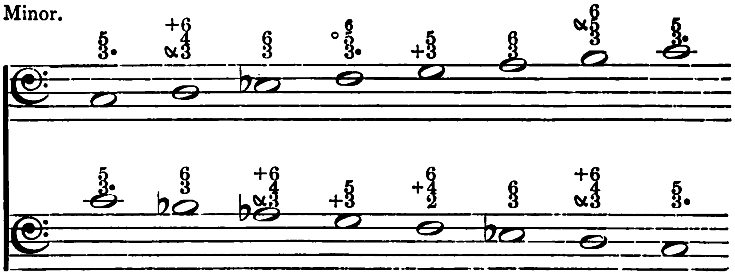
[¶] No special symbol is needed for the diminished intervals, which are sufficiently indicated by the combination of a minor note with a leading note. Nor for augmented intervals, which are merely inversions of the diminished. Superfluous intervals, so called, are not normal intervals, but are formed with either passing or exchanging notes.

The canon of the octave will thus be figured in full:—

Major.



Minor.



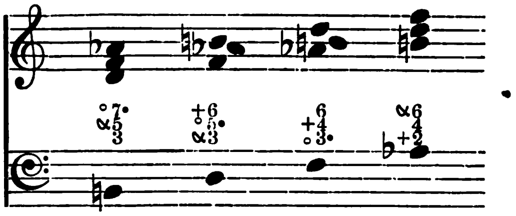
Major abbreviated.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| •3 | +6 | 6 | 6<br>∘5 | + | 6 | ∝5 | •3 |
| •3 | 6 | +6 | + or •3 | +4 | 6 | +6 | •3 |

It will be observed that under this system, in the minor mode, accidentals are no longer required for the figuring of regular chords.

By way of example, let us apply these symbols to the chord of the diminished seventh and its inversions—most confusing under all old methods to any but the experienced eye.

The uninverted chord is played on bequarre—the leading note. Bequarre being designated in all the inversions alike by +, the original form of each chord is seen at a glance.



Observe that the flat fifth, ∝5, played on si, is thus distinguished from the minor fifth, 5•, played on re. These two intervals are essentially different in quality and in treatment; even in extent they differ by a komma.

---

* Sol comes in as tonic, and goes out as dominant.

All normal chords can be expressed under this system of figuring, but there are certain abnormal combinations in use to which it will not lend itself. When such occur the symbols in common use (♯, ♭, and ♮) may be resorted to. The use of one of these will, moreover, shew that the combination *is* irregular; which may be deemed in some degree an advantage.

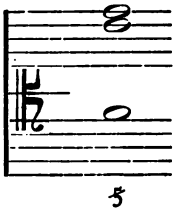
The most frequent cause of seeming irregularity will be anticipation or suspension of the bass, in reality constituting a short pedale or drone bass. In a pronounced pedal passage confusion is best avoided by figuring the real bass, taking no account of the pedal note.

Passing notes or exchanging notes may be described in the usual manner by an oblique line (/).

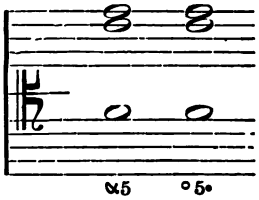
In its abbreviated form this figuring will be found more free from complication than that in common use, with a large gain in regard to precision, enabling us effectually to distinguish intervals or chords which, *on paper*, are seemingly identical.

Take, for instance, the most equivocal of all the chords, the imperfect fifth,—a general term that includes the flat fifth and the minor fifth, intervals differing essentially in character.

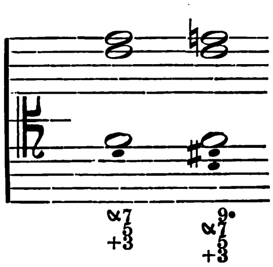
The usual, or numerical, figuring would be, for both alike;—



By the symbolical, or distinctive figuring, the several roots would be indicated:



For the full chords, if played, would be—



# CHAPTER XXIII.

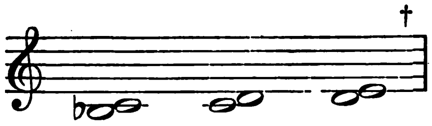
## NUMERICAL VALUATION OF INTERVALS.

In this chapter, which may be read independently, the usual names of notes are reverted to; but with the addition of bequarre and bemol;—the sharp third and the flat seventh on a dominant prime. Also the usual G and F clefs.

It has been held, by writers on the Development of Harmonic Systems that "in the harmonic system certain mutually consistent intervals are *selected*, and the rest have to be completely thrown aside. Numerous highly satisfactory intervals,—as, for instance, that shewn in the sixth overtone, nearly B flat as against C—are lost to the European system."

This is at least an acknowledgment that bemol,* the overtone in question, and b flat, are not identical—not two names for one note. But I have satisfied myself, from close observation, that bemol is in constant use. Bemol is the fourth of a descending scale; and, being the seventh on a dominant, is sensibly flatter than the fourth of an ascending scale, commonly called subdominant. And this flatness is actually rendered by singers and string-players, unless when overborne by the accompaniment. The same, perhaps, with other "unselected" intervals. Unconsciously to the performers, a fine ear guides them to the true intonation. Like Molière's Monsieur Jourdain, elate with learning that he had been speaking prose all his life, they may feel surprised at being told that throughout they had been rendering better notes than those set down for them.

Thence I infer that there are *three* whole tones in actual use; not two only, as we read in the books, namely:—



the measurements of which are as follow:—

Bemol : Ut :: 7 : 8
Ut : Re :: 8 : 9
Re : Mi :: 9 : 10

The question remains whether any other notes not on the stave are in use. I shall presently offer a paradigm shewing how to find the additional notes: the question whether any of these be in actual use must be left to the decision of watchful ears.

---

* Bemol, dominant seventh to C, is to B flat, subdominant in the scale of F, as 63 to 64; a very appreciable komma. The same bemol is to B flat, minor third on G, as 35 to 36.

† It must be noted that although each of these three intervals is formed by a representative cadence, the first signifies a monochordal, or half cadence; the second and third bichordal cadences.

Before venturing upon new ground, it is necessary to make some mention of the old. I revert to a few well-known calculations of value, appertaining to what is called the system of Rameau. This system, often impugned, has held its ground, and will keep it. But it has been cramped through stereotyped notions about the common chord, and still awaits a freer development. It is this that I am seeking to promote, if only in the hope of being suggestive to abler men.

Knowledge of the multiple resonance, and of the division of the string into aliquot parts, is presumed.

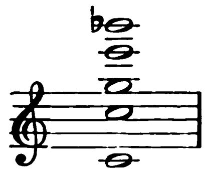
It is ascertainable by experiment that, while the whole string vibrates once, the half-string vibrates twice, giving the octave above the key-note.

The third part, three times, giving the twelfth.

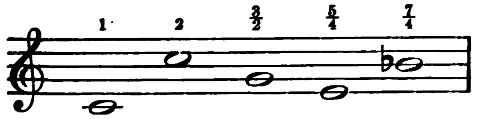
The fifth part (replicates are omitted) five times, giving the seventeenth.

The seventh part seven times, giving the twenty-first. And so on, in infinite series.

If ut . . . . . . = 1
Its eighth above will . = 2
Its twelfth . . . = 3
Its seventeenth . . = 5
Its twenty-first . . . = 7



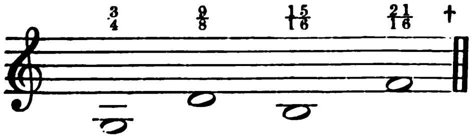
The eighth above 1 being figured by $\frac{2}{1}$, the eighth below will be figured by the reciprocal $\frac{1}{2}$. Therefore, the fifth above ut, being the octave below the twelfth, will be $\frac{3}{2}$; the third (double octave below the seventeenth) will be $\frac{5}{4}$; and the flat seventh (double octave below the twenty-first) $\frac{7}{4}$.*



The numerical values of sol, of mi, and of bemol, are thus established.

If sol be $\frac{3}{2}$, its octave below will be $\frac{3}{4}$. The expression for a fifth being $\frac{3}{2}$, re will be $\frac{3}{2}$ of $\frac{3}{4}$, *i.e.*, $\frac{3}{2} \times \frac{3}{4} = \frac{9}{8}$. The third upon lower sol, bequarre (commonly called si) is $\frac{3}{4} \times \frac{5}{4} = \frac{15}{16}$. The seventh upon lower sol, bemol (commonly called fa), is $\frac{3}{4} \times \frac{7}{4} = \frac{21}{16}$.

Re, bequarre, and bemol are thus established:—



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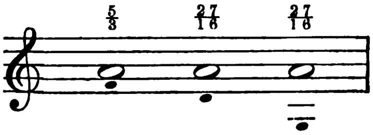
* Vulgar fractions are used, in place of decimals, as making a greater impression on the memory. I find no difficulty in recollecting as many as we shall have occasion to use; but could not name the corresponding decimals without the laborious process of learning by rote. Logarithmic numbers are still more troublesome.

† Writing only for experts, I need not explain the transposition of bemol.

But the *f*, being bemol, belongs to the descending scale only. It remains to ascertain the value of fa (commonly called subdominant) in the ascending scale.

If the twelfth above ut (sol) be $\frac{3}{1}$, the twelfth below ut (fa) will be $\frac{1}{3}$. Raised two octaves, into the medium scale, it becomes $\frac{4}{3}$. But *f* (bemol) is $\frac{21}{16}$. Reduce both fractions to a common denominator, $\frac{63}{48}$ $\frac{64}{48}$, and we find that, bemol : fa :: 63 : 64.

It now remains to find the value of la. This depends upon the bass. If la be based on fa, it is $\frac{4}{3} \times \frac{5}{4} = \frac{5}{3}$. If upon re, it is $\frac{9}{8} \times \frac{3}{2} = \frac{27}{16}$. But $\frac{5}{3} : \frac{27}{16}$ :: 80 : 81. $\frac{27}{16}$ is also the expression for la, major ninth on dominant sol.



Bear in mind that re ($\frac{9}{8}$) has been tuned as a fifth upon sol; and la ($\frac{27}{16}$) as a fifth upon re. I have not seen it elsewhere observed that, in thus piling of fifth on fifth, we diverge from the arithmetical progression with which we began (1, 2, 3, 4, &c.) to a geometrical progression, with $\frac{3}{2}$ for a common ratio. The result, as is well known, is to land us presently on ♯*b*, which does duty for *c*, though sharper than *c*, each of the intermediate fifths taking its share of the accumulated imperfection.

We are now in a position to frame a numerical series indicating the unacknowledged notes.*

The series of superparticulars is familiar: that of subparticulars (to coin a word) has not received equal attention. Let us now proceed to rank the latter with the former, passing, by proportional degrees, from $\frac{1}{2}$, the first subparticular, to 1; and in like manner from 1 to the superparticular $\frac{2}{1}$.

---

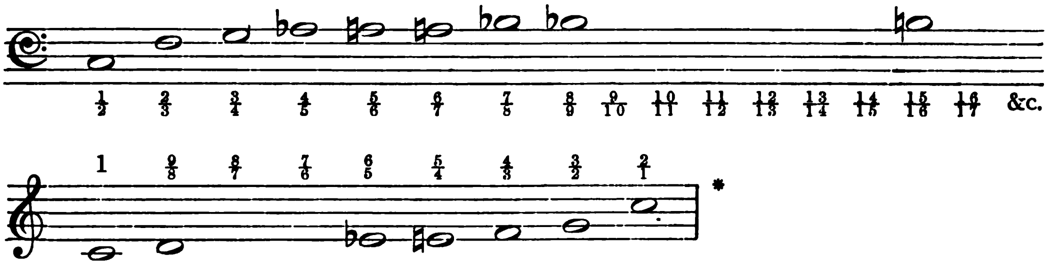
* The use of unacknowledged notes need cause no surprise; for singers and string players have no choice but to sing and play in tune. For that compromise with the ear, called the system of equal temperament, can be effected only by aid of mechanism. The plain fact is, that there is always some amount of clashing between pure intervals and equal temperament—between the players whose notes are governed by ear, and those whose notes are governed by keys. And in this way only am I able to account for the preservation, under equal temperament, of the special characters of the several keys. For, under equal temperament, if perfectly and uniformly carried out, all keys ought, theoretically, to sound alike. There ought to be no difference in character between a flat key and a sharp key.

Thus much to show that these enquiries are not of a "fancy" nature, appertaining only to the science of music, and not to the art. They are practical, and lead to revolution in what is called "thorough-bass."

Let us now pursue the question into further detail.

Mention has been already made of Tartini's crucial *dictum*,—"that it made him tremble to be asked to play a simple gamut." It has been also shewn that the thing cannot be done. That is to say—without the accompaniment of a bass; for, if a bass be conceded, there is nothing more easy. Various basses may be adapted to the scale; and the point is this—that the pitch of the scale-notes varies with the variation of the bass. An element of indecision is thus involved. How is the player of the gamut-scale, if without a bass, to decide between the two la's, which are to each other as 80 to 81, their respective numerical values being $\frac{5}{3}$ and $\frac{27}{16}$.

If 1 be a numerical expression for middle C, $\frac{1}{2}$ will express the eighth below, $\frac{2}{3}$ the fifth below and so forth. $\frac{2}{1}$ will express the eighth above :—



Thus indicating, in addition to the usual notes, certain other notes, as yet unnamed.

The first of these "*ossa innominata,*" is $\frac{6}{7}$. Now $\frac{6}{7}$, being the reciprocal to $\frac{7}{6}$, is the same distance below I that $\frac{7}{6}$ is above. But $\frac{7}{6} = \frac{2}{3}$ (F) × $\frac{7}{4}$ (B♭), and is therefore flat seventh to F; a very flat E♭. $\frac{6}{7}$ is thus shewn to be a slightly sharpened ♮A.

$\frac{7}{8}$ is bemol proper, flat seventh on C.

$\frac{8}{9} = \frac{2}{3}$ (F) × $\frac{4}{3}$, and is therefore B flat, subdominant in the scale of F.

$\frac{9}{10} = \frac{3}{4}$ (G) × $\frac{6}{5}$, and is therefore a minor third on G.

Now most of these are only fancy notes. But the $\frac{4}{5}$ ♭la plays an important part. Theoretically, the $\frac{27}{16}$ la (♮*a*), being only the eighth overtone (a major ninth on the dominant), seems to be more nearly allied to the key than ♭*a*, the minor ninth. Yet we feel that ♭*a* is more nearly related. This is because of its greater cadential propensity to the fifth of the scale. And it really is more nearly related, as shall presently be shewn by a paradigm which reconciles theory with practice.

It is needless to go through all. One more must suffice. $\frac{8}{7}$ represents the same distance above I that $\frac{7}{8}$ does below; but $\frac{7}{8}$ is bemol, forming the largest of the three whole tones. Therefore $\frac{8}{7}$ is re, a little too sharp for the scale.

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* Mr. Drummond Hay, in his fascinating book entituled, The Science of Beauty, as developed in Nature and applied in Art, after explaining the manner in which the law of numerical ratio operates in that species of beauty which is perceived through the ear, extends his demonstration, from music to the sister arts of form and colour. Applying the Pythagorean law of number to the harmony of form, he maintains that the standard of symmetry is deduced from the law that the angles of direction must all bear to some fixed angle the same simple relations which the different notes in a chord of music bear to the fundamental note; that is, relations expressed arithmetically by the smallest natural numbers. Applying the same to colours, he shews the various modifications which their union with each other produces, along with the harmonic relations which these modifications bear to the primaries.

For each of these arts he constructs corresponding scales, to which he adapts a terminology which till then had been appropriated to music alone; distinguishing angles and modifications of colour alike, as tonic, supertonic, mediant, subdominant, dominant, submediant, subtonic, semisubtonic, and tonic again.

The work itself is of remarkable beauty; but, as must now be admitted, the proportionate numerical terms adopted are unsystematically formed, and incomplete. The author took them as he found them. It is to be wished that his treatise, incontestably right in principle, were recast, and freed from the trammels imposed by our imperfect octochord scale and its numerical valuation. Angular measurement ought rather to correspond to the series of superparticulars and subparticulars set out above.

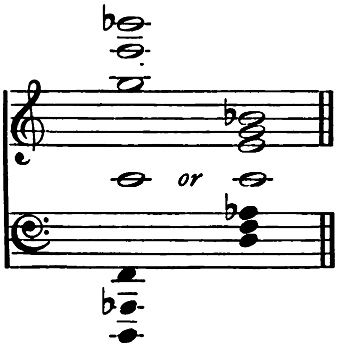
But the $\frac{8}{7}$ re can be arrived at by another process, leading to interesting conclusions, one among these being of a very practical nature.

It will be remembered that we found fa,* by taking the twelfth *below* ut. But why stop at the twelfth? Why not continue the process beyond?

$\frac{3}{1}$, $\frac{5}{1}$, and $\frac{7}{1}$ give the twelfth, seventeenth, and twenty-first above, namely, g', e'', ♭b''. These are mirrored, as it were (to take an idea from riverside trees shadowed in the water below) by $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{7}$, giving the same distances below) namely, $f_{,,}$, ♭$a_{,,,}$, $d_{,,,}$.

Thus, raising the mirrored notes to upper octaves :—

♭$a_{,}$, $= \frac{4}{5}$
$f_{,}$, $= \frac{2}{3}$
$d_{,}$, $= \frac{4}{7}$
d $= \frac{8}{7}$

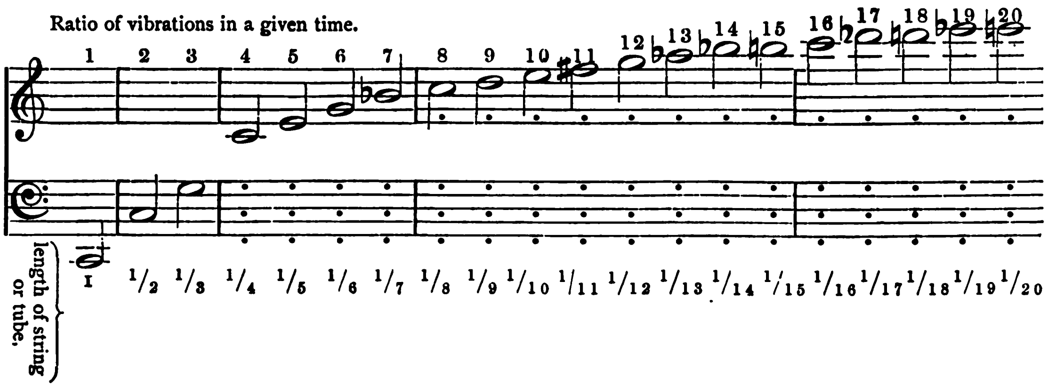


Of these mirrored notes, the ♭a is equivalent to ♭a the minor third upon F. Hitherto, we have obtained a minor third upon a tonic only by postulate.

There are, apparently, other lesser thirds :—*ex. gr.*, from re to Fa, the notes of which are to each other as 27 and 32. But $\frac{32}{27}$ : $\frac{6}{5}$ :: 80 : 81. This, as has been already shewn, arises from the imperfect intercorrespondence of any two tetrachords. Or, again, from re to bemol, which is $\frac{9}{8} \times \frac{21}{16} = \frac{189}{128}$.

It has been maintained that there is yet another lesser third, rendered by the 16th and 19th aliquot parts of the monochord.

The following diagram of harmonics is from Sir Frederick Gore Ouseley's book on Harmony.



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* A vibrating string of a given length will cause a string of three times that length to vibrate sympathetically.

"The next prime number," writes Sir Frederick, "is one of the utmost importance (No. 19), as it gives us the *minor third of nature*, and may be regarded as the source of the whole system of the minor mode."

"It is almost in tune. Indeed it is *more satisfactory to the ear* than the minor third as usually represented by the ratio 5 : 6."

"Reducing it to the first octave, it is represented by the ratio 16 : 19, and only falls short of the usual ratio by the very small comma $^{96}/_{95}$."

But an arbitrary "selection" of overtones does violence to systematic exegesis. The overtones must be taken as they come, in unbroken progression. At which particular distance from the root the upward course should be arrested, may be matter for legitimate question. Sufficient cause has been shewn for coming to a stop at the overtone given by the thirteenth part of the string. It suffices to observe that by ascending high enough among the overtones, and skipping at pleasure, we obtain, not only a minor third—*almost;* but almost any thing else we please.

By a minutely distinctive treatment of intervals, according to their numerical valuation, we are at last enabled to free the science from a prevalent confusion in words. If the question be asked, "Which is highest, ♯a, or ♭b?" the questioner should be desired to say, which ♯a or which ♭b. Also, to name the keys from which he intends respectively to derive these notes. Until then, the question remains meaningless,—a mere jargon of words. The two notes have only a conventional relation. They have nothing to do with each other, save in a misleading cycle of fifths, which lands us in the wrong place. Practically, they are incommensurable, not both existing in the same key.

To reach one from the other, by modulation, fifths have to be tempered; and the temperament must be taken into account of the calculation.

Let it be assumed that ♯a is the leading seventh in the key of B; and that ♭b is flat fourth in the scale of F. To get from the key of F to the key of B, six fifths have to be flattened.

And the reason of this is clear. Without opening the moot question whether all intervals ought to be laid on the Procrustean bed of equal temperament, this at least is certain, that if we are to obtain the notes of all keys by means of a succession of fifths, we *must* begin by getting rid of the komma of Pythagoras,* *i.e.*, of the difference between C and ♯B, distributing the imperfection.

---

* Tuning by fifths and fourths, it will be found that the numerical value of ♯b is $\frac{531441}{262144}$, which is greater than 2, the value of octave C. Lowered by an octave, ♯b will be to C as $\frac{531441}{524288}$ to 1; the difference being $\frac{7153}{524288}$, or about $\frac{1}{73}$. It is hardly necessary to observe that the numerator of the fraction $\frac{531441}{524288}$ is obtained by multiplying 3 into 3 eleven times; and the denominator by multiplying 2 into 2 eighteen times.

# VOCABULARY.

It is usual to arrange the terms of a glossary in alphabetical order. But as this would be inconsistent with the grouping that is required for the purpose of shewing their dependence upon each other, the leading terms are taken somewhat in the order of their importance.

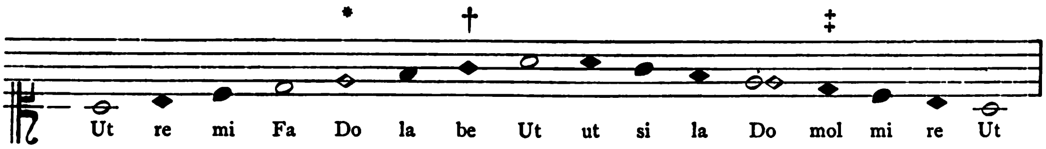
In establishing meanings, modern convenience only is consulted, not antiquarian precision; for even where age must be confessed, the preciseness is too often wanting.

## Names of Notes.

**Prime** :—fundamental note, radical or root; bearing overtones. Expressed in notation by open notes :—⬭, for tonic and sub-dominant primes; ◇, for dominant primes. A prime that enters as tonic and goes out as dominant, or *vice versa*, ⬭◇; ◇⬭. In letters, by capitals; A. When not to be played, a tonic prime is indicated by *w*·; a dominant prime by ·*м*.

**Overtones** :—acute harmonics; in use as far as the seventeenth note from the tonic prime, and the twenty-seventh from the dominant prime. These (excepting replicates to primes, which are written as primes, but with smaller marks,—○, ◇) are expressed by close notes,—●, ◆. Alphabetically, by small letters,—a.

**Scale Notes** :—the seven grades, or degrees of the scale. They are thus named:



*N.B.*—i. In every key, the first of the scale is Ut. So κ. τ. λ.

ii. Fa, the fourth of the ascending scale, is prime; being the upper tonic, commonly called subdominant. The corresponding note in the descending scale is an overtone, being flat seventh to a prime, and is therefore bemol.

iii. The fifth of the scale, when accompanied by $^{5}_{+3}$, is prime; Do-sol, or Do. When by $^{6}_{4}$, it is an overtone, called sol; no longer dominant, but only the fifth of the scale, on a tonic prime. When by $^{5}_{\flat 3}$, it becomes by modulation a tonic prime in a new scale.

---

* Or Do-sol. † Or Bequarre. ‡ Or Bemol.

iv. The seventh of the scale, ascending, is bequarre. Descending, it is si; more properly mi, the third in a new scale.

v. Ut, the highest note of the descending scale, is not necessarily prime, though commonly treated as if it were. It has been already shewn to be, in strictness of treatment, an overtone. *Vide* p. 39.

vi. The fifth of the descending scale comes in as tonic, and goes out as dominant.

CHORD NOTES:—dissonant overtones,—the ninth, eleventh, and thirteenth on the dominant; named, do-la, do-ut, and do-mi. They are needed in the formation of certain chords.

STAVE-NOTES:—c, d, e, &c.; fixed names, denoting pitch; *i.e.*, the actual notes on the clavier. Contrasted with ut, re, mi, &c., denoting position in the scale,—first, second, or third of any scale, and transposable.

LEANING NOTE:—an appoggiatura.

CATCHING NOTE:—an acciaccatura.

APPELLATIVE NOTES:—calling for resolution.

TRANSITIVE NOTES:—cadential.

INTRANSITIVE NOTES:—resting notes.

EXCHANGING NOTES:—commonly called, "changing notes." The curtailed expression is not easy to understand.*

NOTÆ ABJECTÆ:—unacknowledged or unessential notes.

ACCIDENTAL NOTE:—any sharp or flat note leading to a change of key; commonly, but loosely held to mean any sharp or flat note not included in the armature of the stave.

RESULTANT, OR COMBINATION TONES:—Tiersons; sometimes called Tartini's tones: by Helmholz, difference tones, representing the difference of the primaries; and summation tones, representing the sum of the primaries.

TONIC:—Ut.

UPPER TONIC:—commonly called "subdominant,"—Fa.

DOMINANT:—the word to be used in the modern, not in the ancient acceptation; Do, or Do-sol.

DOUBLE DOMINANT:—re, the fifth on the Dominant, commonly called "Supertonic."†

LEADING NOTE:—bequarre, or be, in the ascending scale; commonly called "si."

COUNTER-LEADER:—bemol, or mol, the seventh on the dominant, and the fourth of the descending scale. Commonly called, fa.

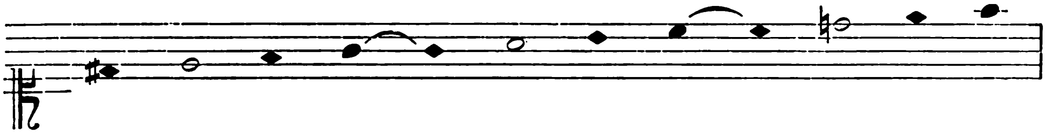
APPELLATIVE CONCORD:—the flat seventh on the dominant; bemol.

---

* The French say,—"par échange des notes;" which is clear.

† An unmeaning word. The character of re is that of the dominant, intensified; more especially when proceeding to the tonic, through the dominant. Re is the most interrogative note of the scale.

Equivocal Note :—the fourth of the scale, which may, under certain conditions, be either Fa, or ♯f. It will be observed that both these notes are contained in the Decachord, or normal three tetrachord scale.



Minor Notes :—♭ mi and ♭ la; also ♭ si of the descending scale.

## Classification of Intervals.

Monochordal Interval :—of which the two notes have one prime.

Bichordal Interval :—of which the two notes have two primes.

Major Interval : formed with mi or la.

Minor Interval :—formed with ♭ mi or ♭ la.

Diminished Interval :—formed by ♭ mi or ♭ la upon bequarre.

Augmented Interval :—the inversion of a diminished interval.

Sharp, or Leading Interval :—of which the upper note is bequarre.

Flat Interval :—of which the upper note is bemol.

Mutable Interval :—of which one note may be minorized; formed with mi or la. Commonly called "imperfect concord."

Superfluous Interval :—*Ex. gr.*, Ut—♯ sol. The term may be conveniently retained, though incorrect. The example given, being formed by an exchanging or by a passing note, is not a legitimate interval, but only a *distance*.

## Names of Intervals.

Tone :—or second; re—mi; re—Ut; Ut—bemol. These may be distinguished, specifically, as the 10 : 9 tone, the 9 : 8 tone, and the 8 : 7 tone. There is also a fourth tone, hitherto unnoticed, though in common use, as $\frac{6}{5}$,—from the eleventh on the dominant to the twelfth. The eleventh being sharper than the tonic, the tone is proportionally lessened. See page 60.

False Tone :—from Ut to re, or from mi to re.

Little Tone, or tonule :—bequarre to Ut; or mi to Fa.

Ditonus :—the ancient major third; the sum of two 9 : 8 tones.

Leimma :—243 : 256; the remainder after subtraction of the ditonus from the fourth.*

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* It is possible (though I have not verified the conjecture by experiment) that the Pythagorean leimma may be the interval in actual use, when passing from the sharp seventh of the scale to the eighth. For the interval supplied by the usual calculation, 15 : 16, is confessedly too wide. The ditonus is obtained by use of the 27 : 16 la, in place of the 5 : 3 la. From g to that a is a 9 : 8 tone; from a to b is another 9 : 8 tone, for it is the diazeuctic tone; and a leimma, from b to c, remains.

Komma :—the difference between the 5 : 3 la and the 27 : 16 la, being 80 : 81 ; or between bemol and Fa, being 63 : 64[*].

Greater Third :—generic term[†] for all thirds commonly described as composed of four half tones.

Lesser Third :—generic term for those composed of less than four half tones.

Major Third :—a specific term ; Ut—mi.

Minor Third :—Ut—♭mi.

Sharp Third :—Do—bequarre.

Upper Third :—major, Fa—la ; minor Fa—♭la.

Little Third :—mi—sol ; little third minor, ♭mi—sol.

Upper Little Third :—la—Ut ; upper little third minor, ♭la—Ut.

Dominant Little Third : bequarre—re.

Diminished Third :—commonly so called, but in reality abnormal, ♯fa—♭la.

Consonant Fourth :—sol—Ut.

Dissonant Fourth :—Do—do-ut.

Discordant Fourth :—a discord by prolongation.

Sharp Fourth, or Tritonus :—bemol—bequarre.

Diminished Fourth :—bequarre—♭mi.

Imperfect Fifth :—generic name for all the lesser fifths.

Minor Fifth :—specific term ; re—♭la, or la—♭e.

Flat Fifth :—bequarre—bemol.

Major Sixth :—mi—Ut.

Minor Sixth :—♭mi—Ut.

Sharp Sixth :—re—bequarre.

Augmented Sixth :—♭la—♯fa.

Great Sixth :—fa—re ; or, more strictly, bemol—re.

Great Seventh :—bemol—do-mi ; or bemol—♭do-mi.

Flat Seventh :—Do—bemol.

Diminished Seventh :—bequarre—♭la.

The remaining intervals can be easily named in accordance with rule.

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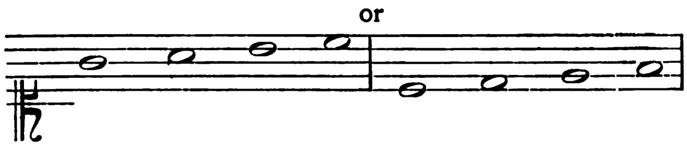
[*] There are many kommas, for the most part matters of curiosity.

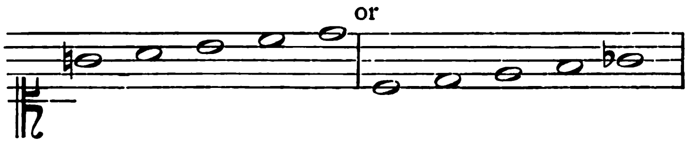
[†] The generic terms will be found convenient excepting where specific description is needed. By adoption of "greater," and "lesser," we are enabled to restrict "major" and "minor" to their modal signification.

## SEQUENCES.

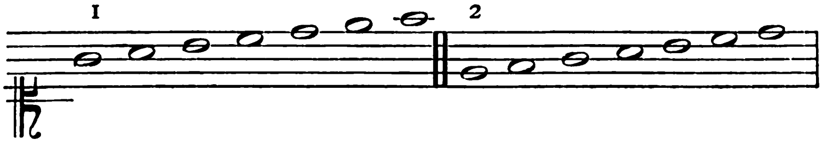
TETRACHORD.



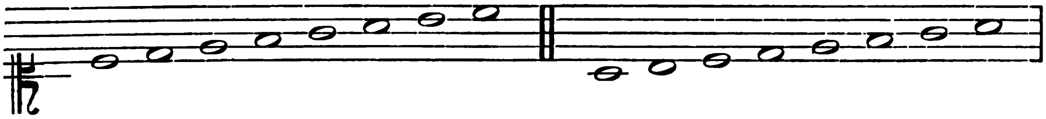
PENTECHORD, or LESSER DIAPENTE.



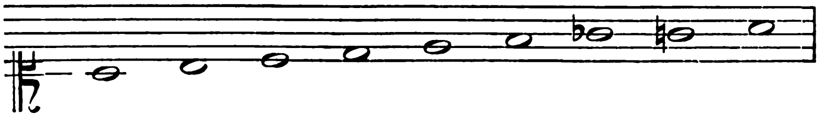
HEPTACHORD :—*
1. Normal.
2. Standard.



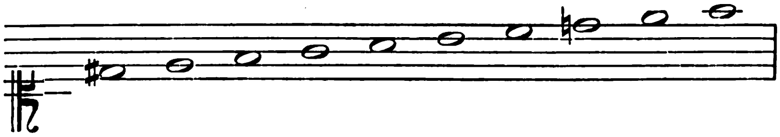
OCTOCHORD :—normal, based on mi; standard (of two formations,—by two tetrachords or by three) on Ut.



HENNEACHORD :—

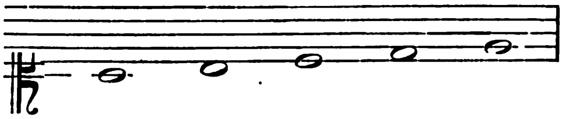


DECACHORD :—the succession of three tetrachords.

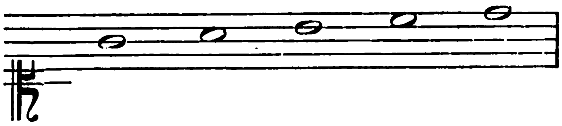


DIAPASON :—the standard octochord.

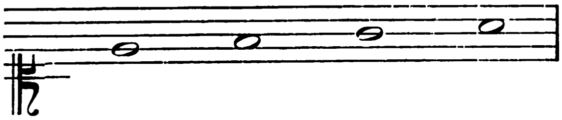
DIAPENTE :—



LESSER DIAPENTE, or PENTECHORD :—



DIATESSARON :—



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[*] There is no hexachord; at least on the cadential principle.

## CHORDAL TERMS.

CHORD :—three or more simultaneous notes, having relation to each other. This definition includes dissonances, and excludes discords.*

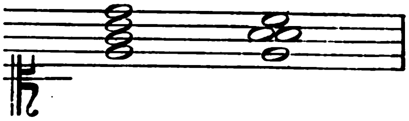
GREAT CHORD :—do, bequarre, re, bemol, do-la, do-ut, do-mi; represented numerically by 1, 3, 5, 7, 9, 11, 13.

TRIAD :—$\substack{5\\3}$ on a tonic; or, in earlier form, $\substack{6\\4}$ on the fifth of the scale.

TETRAD :—$\substack{7\\5\\3}$ on the dominant. The tetrad is the cadential chord.

PENTAD :—$\substack{9\\7\\5\\3}$ on the dominant; still more strongly cadential.

DOUBLE CHORD :— The sequence of tetrad and triad.



EPICENE CHORD :—commonly called, a doubtful chord; *i.e.*, a chord that may be considered as belonging either to the key we are in, or that to which we are going.

DISSONANCE :—an acknowledged overtone more acute than the flat seventh.

DISCORD :—a note alien to the prime; *ex. gr.*, a ninth upon the tonic.

## CADENCES.

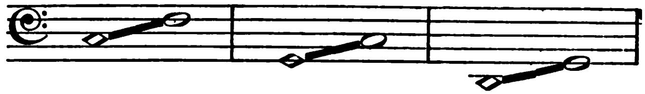
MONOCHORDAL, OR HALF CADENCE :—on one monochord; *ex. gr.*, from sol to mi, on the tonic monochord, or from re to Do-sol on the dominant monochord.

BICHORDAL CADENCE :—full cadence, or simply, cadence, as contrasted with half cadence: from one monochord to another. *Ex. gr.*, Do-sol to mi, or Do-sol to Ut.

These terms are generic, including specific names, which are as follow.

UPPER CADENCE :—

MEAN CADENCE :—



LOWER CADENCE :— all from dominant to tonic;—the generators of the three tetrachords of the standard scale.

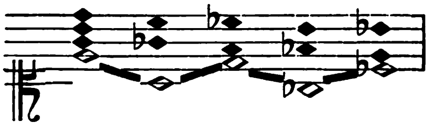
COUNTER-CADENCE :—from tonic to dominant.

PRIME CADENCE :—formed by primes only.

HARMONIC, OR REPRESENTATIVE CADENCE :—formed by overtones.

BROKEN, OR ABRUPT CADENCE :—from Fa to Do-sol.

CONTINUOUS, OR CHAIN CADENCE :—from Do to Do,—*i.e.*, α7, α7, α7, &c.
κ. τ. λ.



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* A dissonance belongs to a chord; it is one of the family. A discord is a stranger,—an intruder.

PLAGAL CADENCE :—seemingly from Fa to Ut; in reality from the upper tonic to the dominant of that tonic. The plagal cadence is therefore a countercadence.

## VARIOUS TERMS, UNCLASSIFIED.

TIME :—restricted in meaning to pace; movement.

MEASURE :—rhythm; by the old writers called "Proportion;" *ex. gr.*, double, triple, or four time.

ARMATURE :—the indication of the key, at the head of the stave, commonly called, "signature."

CLANG-TINT :—the quality of the sound. Called by Thomas Young, "register colour." Gallicé, "timbre." Ted. "Klang-farbe." Occasionally, by English writers, "tone colour."

SYNONYMOUS CHANGE :—commonly, but loosely, called "enharmonic change."

DOUBLE TREATMENT :*—the *double emploi* of D'Alembert.

PRIME, or GROUND-BASS :—composed of root notes only; contrasted with thorough-bass.

DRONE-BASS :—said to mean, "tonic pedale;" but ought to mean any pedal point whatever, as being more English than pedale, and the more expressive term.

MODE :—major or minor; meaning also, Church mode.†

MINORIZE :—to lower a tonic third by a half-tone.

TONIC MINOR SCALE :—having the same key-note as the major; contrasted with the relative minor, bearing the same armature.

GRADUALLY :—diatonically; adopted as less pedantic.

DIRECTLY :—by similar motion.

DIVERSELY :—by contrary motion.

CLOSE :—*ex. gr.*, the Grand Close; the Plagal Close. Commonly called, "cadence;" but though every close is either a cadence or a countercadence, every cadence is not a close.

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* For the most part applied only to enharmonic or synonymous changes; but which should be extended to all bi-frontal notes; *ex. gr.*, the fourth note of the tetrachord, which in the old notation is either mi or la; or to the change, from tonic to dominant, of the fifth in the descending scale.

† Mode, and tone as applied to the ancient scales, seem to be used interchangeably. It might be possible to restrict the use of the word "mode" to the Latin scales, reserving "tone" for the Greek.

# APPENDIX.

It has been stated in the text that Shakspeare employs musical terms with invariable correctness: *i.e.*, according to the correct use of his own time. This dictum might be generalised; for he never misapplies any technical term whatever. No matter how wide the range of art or science, as known in those days, his mastery over the expressions appertaining to either is complete.

In this mine, there is a rich lode of ore, as yet but half worked out by the numerous miners therein. Only the phrases pertaining to legal phraseology have been gathered; and even of these the whole are not to be found in any one collection.

Take, for instances, seafaring technicals; hawking, hunting, archery, dancing, fencing, bowling, gaming, heraldic, logical, theological, astrological, or theatrical technicals,—all these may be included, and possibly more, within the category.

No writer is more dainty or precise in his employment of words; restricting them much more closely to their derivative meaning than is customary among ourselves, and, where possible, to their technical use, which is always the most vivid and specific. Bearing in mind these two rules, the student will find that many passages, seemingly obscure, become clear and picturesque.

We are now concerned with musical terms alone. My own collection of these cannot be far from exhaustive; but this is not the place for what savours too much of antiquarian research. Yet it may be not amiss, with a view towards inciting further research, to call attention to some peculiarities of their use.

Let us examine the opening speech in "King Richard III." with critical exactitude. How many loose-readers are able to construe it,—*sensum enucleare*, having regard to absolute precision in the use of words?

The key to it is this. Richard's love of music is historical. Also, his affectation of wit, or of what was equivalent to wit in those days,—playing upon the word. It seems to have remained unnoticed or unperceived, that Richard quibbles through his opening speech, in terms of his favourite art. This will be made clear, by italicizing the technical terms. Some of them need explanation, having long since passed out of use.

Now is the winter of our discontent
Made glorious summer by this sun of York;
And all the clouds, that lowr'd upon our house,
In the deep bosom of the ocean buried.
Now are our brows bound with victorious wreaths;
Our bruised arms hung up for monuments;
Our stern alarums changed to merry meetings,
Our dreadful marches to delightful *measures.*
Grim-visaged war hath smoothed his wrinkled front;
And now—instead of mounting barbed steed,
To fright the souls of fearful adversaries—
He capers nimbly in a ladies' chamber,
To the *lascivious* pleasing of a *lute.*
But I—that am not shaped for sportive tricks,
Nor made to court an amorous looking-glass;
I, that am rudely stamped, and want love's majesty,
To strut before a wanton ambling nymph;
I, that am curtailed of this fair *proportion,*
Cheated of feature by dissembling nature,
Deformed, unfinished, sent before my time
Into this breathing world, scarce half made up,
And that so lamely and unfashionable
That dogs bark at me, as I halt by them;
Why I, in this weak *piping* time of peace,
Have no delight to pass away the time;
Unless to spy my shadow in the sun,
And *descant* on my own deformity;
And therefore, since I cannot prove a lover,
To entertain these fair well-spoken days,—
I am *determined* to prove a villain,
And hate the idle pleasures of these days.
Plots have I laid, *inductions* dangerous,
By drunken prophecies, libels, and dreams,
To *set* my brother Clarence, and the king
In deadly hate the *one against the other:*
And, if king Edward be as true and just
As I am subtle, false, and treacherous,
This day should Clarence closely be mewed up;
About a prophecy, which says, that *G*
Of Edward's heir the murderer shall be.

Some of the allusions may seem trivial, or far-fetched; but, taking them all together, no doubt can remain as to the leading idea in the mind of the play-wright.

Many of the terms being obsolete, a few explanatory notes and parallel passages are subjoined

"Delightful measures:"—"The triplex, Sir, is a good tripping measure." "Twelfth Night," A. v. Sc. 1.

Triplex, explaining measure, is, according to Morley, more correctly, tripla; one of the proportions in Music,—Dupla, tripla, quadrupla, sesquialtera, and sesquitertia. Morley's explanation of "dupla" serves for all. "Dupla . . . is that which taketh halfe the value of every note and rest from it, so that two notes of one kinde do but answer to the value of one, and it is knowen when the upper number containeth the lower twise, thus, $\frac{2}{1}$ $\frac{4}{2}$ $\frac{6}{3}$ $\frac{8}{4}$ $\frac{12}{6}$. . . . But by the way you must note that time out of minde we have learned that we set dupla where we set two Minimes to the Semibrief, which if it were true, &c." Our author proceeds to inveigh furiously against the corrupters of the term; quoting with perfect gravity, the story of "*amicus Plato sed magis amica veritas.*"

"The fift way (of figuration) is called Tripla, when for one note of the plain song, they make three black minimes; . . . though (as I told you before) this be not the true Tripla, yet have I set it downe unto you in this place, that you might know not only that which is right, but that which others esteemed right."

Morley's Introduction to Music, Part I., p. 32, and Part II., p. 102, Ed. 1771.

"The lascivious pleasing of a lute:"—The key of C (the ecclesiastical Ionic, or Greek Lydian, was looked upon with disfavour by the purists as the "*Modus lascivus.*"

"This fair proportion:"—"He fights as you sing prick-song, keeps time, distance, and proportion; rests me his minim rest, one, two, and third in your bosom." "Romeo and Juliet," A. ii. Sc. 4.

Proportion is defined by Morley to be—"The comparing of numbers placed perpendicularly one over another. . . . Proportion is either of œqualitie or of inœqualitie. Proportion of œqualitie is, the comparing of two equall numbers together; in which, because there is no difference, we will speak no more at this time. Proportion of inœqualitie is, when two things of unequall quantity are compared togither, and is either of the more or the lesse inœqualitie. Proportion of the more inœqualitie is when a greater number is set over and compared to a lesser, and in Musick doth alwaies signifie diminution. Proportion of the less inœqualitie is, where a lesser number is set over and compared to a greater, as $\frac{2}{3}$, and in Musick doth always signify augmentation. . . . There be five in common use with us; Dupla, Tripla, Quadrupla, Sesquialtera, and Sesquitertia."

Morley, Part I., p. 31.

"And descant on my own deformity:"—"For on that ground I'll make a holy descant." Richard III., A. iii., Sc. 7. Descant is the art of correctly adding parts at sight to plain chant. The rules are elaborately laid down by Morley.

"I am determined:"—Tinctor's Dictionary is entitled, "Terminorum musicæ Diffinitorium."

"Inductions dangerous:"—Induction is an old musical term, signifying numbers prefixed to a stave of music to denote the measure: the armature.

"To set" . . . the one against the other:—in counterpoint.

Even the letter G involves a quibble; of indifferent quality, but in keeping with the rest of the speech. These technical terms have hitherto lain unsuspected in the text.

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4